February 1992 Issue #7

Radio Fu [redacted]

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# The Best of 73s

Boy Scouts from Troop 73 and Cub Scouts from Pack 73 in Springfield, New Jersey, participated in the 34th annual Jamboree on the Air, or JOTA, an annual event sponsored by the World Bureau of the World Organization of the Scout Movement. The Jamboree on the Air was held worldwide on October 19th and 20th last year. Thousands of amateur radio stations around the world invited local scouts to visit their homes and participate in the operation of their ham radios. The operators established contact with other participating national and international ham operators who also had scouts visiting their ham shacks. The scouts were able to talk to their fellow scouts hundreds or thousands of miles away. Typical information exchanged consisted of location, scout rank, name, hobbies, and so on.

Springfield Scouts took to the woods and set up at the Watchung Reservation in Mountainside, New Jersey, on October 19, 1991. Springfield Emergency Management Staff Members Scott Seidel WA2WUX, Marc Lepore N2GIH, Ron Scull WA2QNZ, Paul Hawryluk WB2ITW, Adam Seidel KB2KOQ, Eric Deutchman WB2LMW, Jeff Katz WB2DVC, and Marc Marshall KB2KEC set up a temporary outdoor radio station.

A portable generator was used to power the station, and scouts gathered around the radio to participate in the Jamboree. Stations were contacted via 10 meter SSB in New Mexico (KA5VFU); Gulfport, Mississippi (N5QZK); Overland, Kansas (KB0JNK); West Palm Beach, Florida (N4ZWC); and W5DDC at the Mount Bayou Scout Camp in Central Louisiana.

The Scouts were able to talk to hams in Bulgaria (LZ2WM); Albania (ZA1QA); and Blackwood, Wales (U.K., GW0MAW). Equipment used was a Kenwood TS-430S and a long-wire Windom antenna. A packet radio computer station was also set up by Marshall and used to exchange information via computer between hams. *TNX WA2WUX for the news!*

**From left to right, standing: Eric Deutchman WB2LMW, Zachary Marshall and Marc Marshall KB2KEC; seated: Marc Lepore N2GIH, Scott Seidel WA2WUX, and Adam Seidel KB2KOQ. The Springfield Emergency Management Command Post is in the background. (Photo by Ron Scull WA2QNZ.)**

# Shuttle News

The Kennedy Space Center reports that the following eight shuttle missions are scheduled for 1992: STS-42, the *Discovery*, will carry the first International Microgravity Laboratory mission into orbit; STS-45, the *Atlantis*, will carry the Atmospheric Laboratory for Applications and Sciences (ATLAS-1); STS-49, *Endeavor's* maiden flight, will feature the most complex satellite retrieval mission to rescue the stranded INTELSAT-VI; STS-50, the *Columbia*, will make its first return flight after modifications, allowing this to be the first extended duration orbiter flight; STS-46, the *Atlantis*, will deploy Eureca (European Retrievable Carrier) and the Tethered Satellite System; STS-47, the *Endeavor's second flight*, will carry Spacelab-J (Japan) into orbit on a seven-day flight; STS-52, the *Columbia*, will deploy the Laser Geodynamic Satellite, LAGEOS; and STS-53, the *Discovery*, will be a dedicated DOD mission. *TNX SpaceNews Dec. 30, 1991 via MCImail.*

# Ham Dentist Helps Romanian Ham

Dr. Rick Novick KB5MGF gave 18-year-old Stephen Samu YO6OBH a special Christmas present: dental material to fix his cavities. Stephen's dental problems couldn't be corrected in his hometown of Reghin, Romania, because of a lack of basic dental materials. Novick was scanning the airwaves last March when he contacted Samu. Novick sent Samu a brochure from his office, and Samu gave Novick the name of the product his doctor could use. Novick then called his contacts at Unitek, a dental supply company, and the company donated $150 of filling material to Novick, who then mailed it to Samu, 6,400 miles from El Paso, last November. Samu received the material the week before Christmas. *TNX El Paso Times, Dec. 23.*

# Petition to Restrict Contest Frequencies

Burt Fisher K1OIK of South Dennis, Massachusetts, has submitted a petition to the FCC to restrict contest operations in order to "reduce interference to other communications." He doesn't want contests to end; he just wants to restrict the frequencies they could use. He wants to make it a violation for contest operations on the following frequencies: 28.060–8.070; 28.460–28.500; 21.060–21.070; 21.410–21.450; 14.060–14.070; 14.330–14.350; 7.060–7.070; 7.280–7.300; 3.560–3.070; and all new WARC bands. *TNX BNT*

# DOVE Status Report

As of January 1, 1992, the DOVE-OSCAR 17 beacon has still not been heard on its 2 meter downlink of 145.825 MHz. Earlier, the word from AMSAT-NA officials was that the satellite was supposed to be "talking" by Christmas.

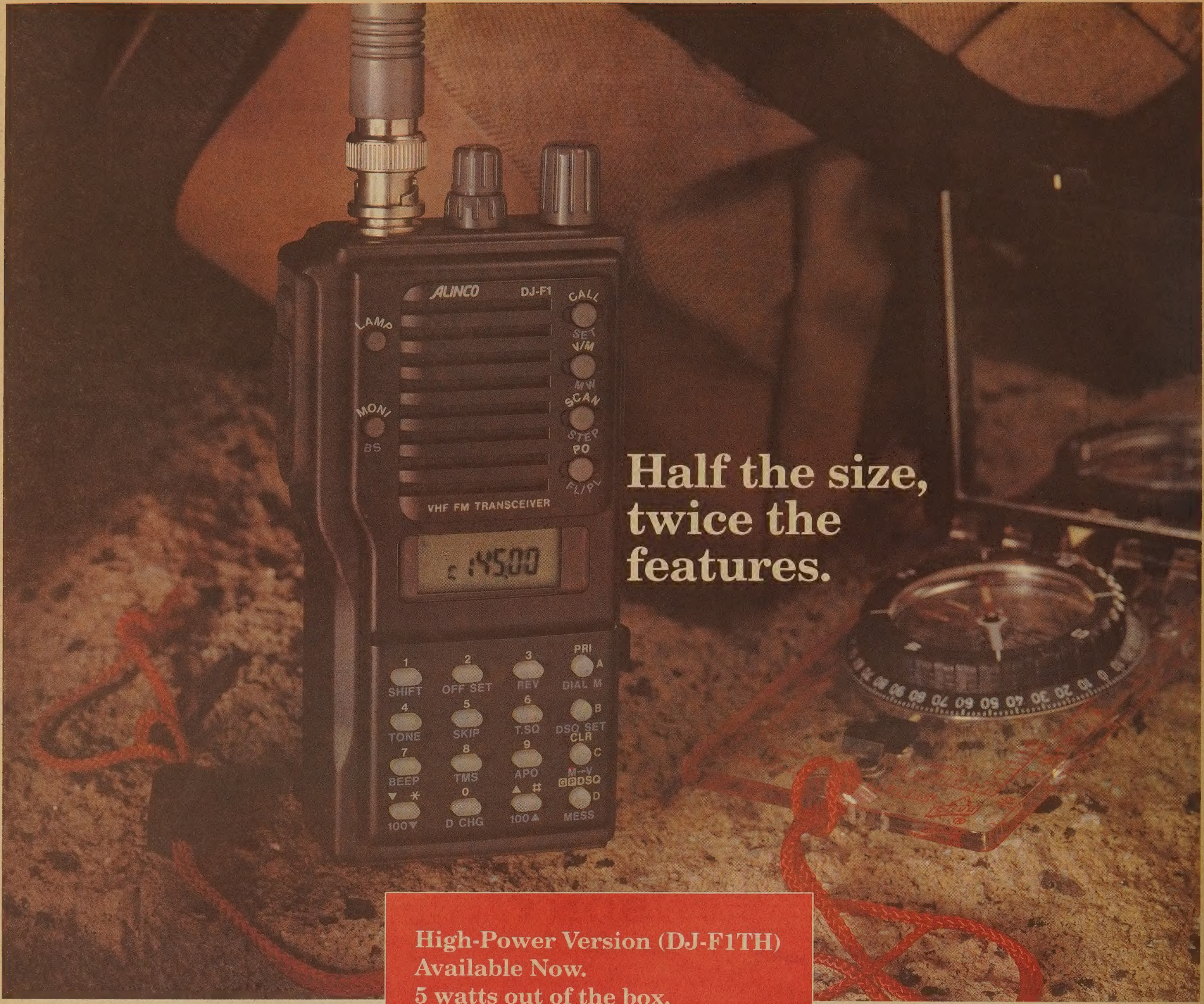
Many satellite operators had hoped that it would at least be putting out packet radio data, which many folks both new and old to the amateur space community enjoy copying. Any regular amateur radio station equipped with even the most simple and basic packet radio capability could copy the DOVE when it was overhead with its FM beacon operating in standard AFSK packet mode. Many operators have used simple indoor antennas with good results, and small quarter-wave vertical antennas mounted outside and in the clear performed even better. The DOVE's signal was strong and clear!

If operated in the synthesized voice mode, only a simple FM scanner or monitor type radio receiver would be needed. The voice bulletins could be copied by hams, schools, and other interested individuals around the world, to the betterment of the entire amateur radio community. The dream still remains unfulfilled after nearly two years of hard work by the volunteers on the AMSAT-NA satellite engineering team.

In a recent interview with Dr. Junior DeCastro PY2BJO, president of AMSAT-Brazil (BRAMSAT) and owner of the satellite, Junior stated that definitive action will be taken by January 21, 1992, if further progress is not achieved. That date marks the second anniversary of the launch. To this date the bird is still only transmitting on 2.4 GHz, and he said that AMSAT-NA management gave no reasonable explanation for the delay.

Unsolicited comments from several *OSCAR Satellite Report* readers in Canada, observing the DOVE project failure in terms of both engineering and information to AMSAT-NA members, have indicated that they're

Continued on page 14



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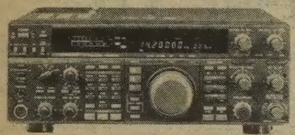

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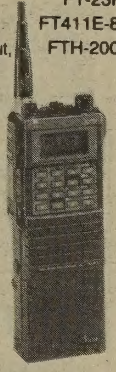
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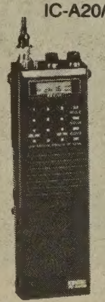
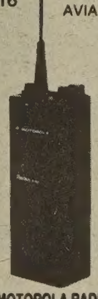

IC-H16/U16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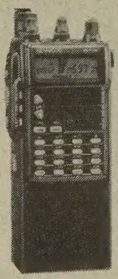
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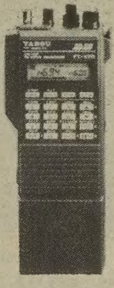
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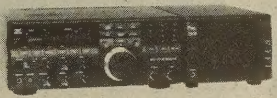

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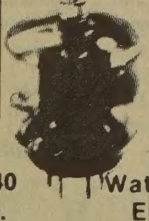

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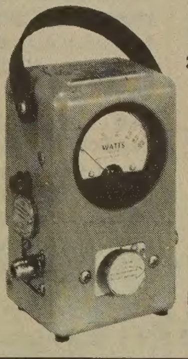

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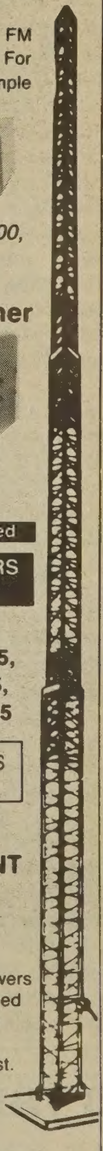

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# Globalfest in Arkansas

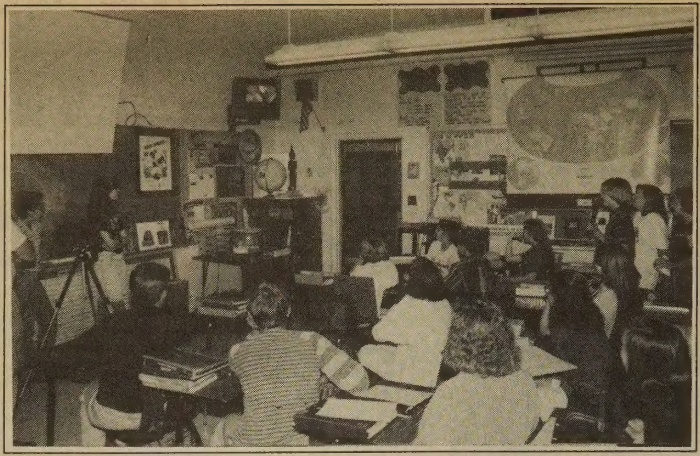
Last October, the Arkansas River Valley Amateur Radio Foundation participated in an event called Globalfest. Globalfest is an international cultural fair with food, exhibits, and performers from all over the world. It is sponsored by the language department at Arkansas Tech University and the Russellville Chamber of Commerce. Friday, October 11, was mainly for school children, with over 5,000 attending.

The Arkansas River Valley ARF set up a number of displays. One was a special event station with two transmitters operating SSB on 20, 15, and 10 meters. Another was a Morse code exercise: Children looked at a chart of Morse code and sent their names. Ben Hillis W5HH, George Latham KB5MPB, and other patient volunteers helped the children with this. After the child sent his or her name, he was given a certificate. The response was amazing—children were lined up for 50 feet to work the key. The first stop was an information table with brochures and a place to sign up to be notified about licensing classes. Many went back and signed up after trying CW. One youngster insisted on writing down the chart of letters and dits and dahs so he could practice as soon as he got home!

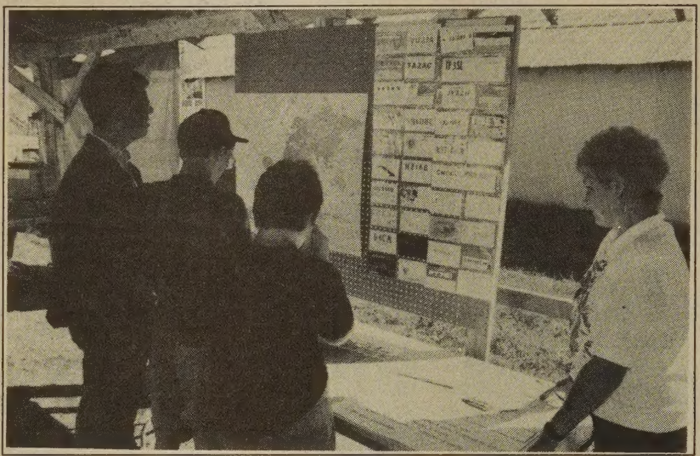
The next stop was a map exercise. DX cards from all over the world were displayed with a world map. Children would pick out several cards and try to identify the countries or continents (depending on the children's ages). Again, a certificate of achievement was given.

Then, packet radio. Karl Goebel KB8DM showed how packet worked. Many youngsters were excited by packet, and one of the potential hams recruited was a 19-year-old girl. Using the packet station, greetings from Globalfest were passed to U5MIR on the Russian space station *Mir*.

Charles Shingleur KF5JH and Dennis Schaefer W5RZ put on an ATV demonstration in full duplex, with one end transmitting on 421.25 MHz, and the other end transmitting on 439.25. With 80 feet of antenna separation, there was little interference. Ms. Bette Hendrix, a teacher at Russellville Middle School, enthusiastically participated with five of her Friday 7th grade classes. WB5VOX, owner of a music store, assisted at the school, and was able to help with some audio problems.



**The Russellville Middle School ATV demonstration captured the attention of five classes.**



**Mary Carlson KB8CJT at Globalfest, helping with the map project—matching QSL cards to their countries of origin.**

The club used PC Electronics transmitters and downconverters on both ends. At the school, W5RZ used a KLM 10-element beam for transmitting and a homemade quagi for receiving. At Globalfest, Charles KF5JH used a collinear for transmitting and a corner reflector UHF TV antenna for receiving. An "engineer" was recruited from each class to turn on a VCR giving our station ID every 10 minutes.

The Arkansas River Valley Amateur Radio Foundation actively promotes amateur radio. In a town of 17,000, it has over 120 club members! Upgrades are common, and there are over 20 volunteer examiners in the club. Yearly Novice/Tech classes are held, and newcomers find plenty of willing assistance. Members experiment with ATV, packet radio, satellites, and more, and are always willing to help someone who wants to do more than rag-chew on 2 meters—though the ARVARF does have one of the best repeaters in the state, as well as a packet BBS and mountaintop node. The oldest member, 83-year-old Grady Hudlow K5OES, is very active and willing to try new things.

A month after Globalfest, Dennis W5RZ and others went back to some of the Middle School classes with a demo of HF and VHF equipment. More school projects are planned . . . W5VYH, the club president, has appointed a committee to work with area schools. *TNX Dennis Schaefer W5RZ for the information.*

# Observant Ham to the Rescue

On October 26, 1991, a disabled veteran was driving his car down Highway 24 near Huntsville, Alabama, when he noticed smoke coming from his vehicle. He pulled his car over to the shoulder of the highway, but was unable to get out. Many people passed him during the moments he struggled, but only Decatur Amateur Radio Club member Nathan Tate KC4PBM bothered to turn around and investigate. Nate, observing the smoke as he approached the vehicle, quickly assessed the situation and, with no regard for his own safety, pulled the man out of the burning car just moments before it was engulfed in flames. A police officer appeared on the scene, and while he helped Nate carry the man further from the burning car, it exploded. Serious injury, if not death, would have resulted if Nate had not acted when he did. *TNX VOX, the December issue, and Randy Probst W4MOI, EC for Morgan County.*

# Ham Mariner

The November 27th *Los Angeles Times* newspaper carried an extensive article on how French adventurer Gerard d'Aboville TM6ABO used his ham radio every day to call Fred Boehme KH6UY in Hawaii on 14.313 MHz to report his progress in rowing across the north Pacific Ocean.

Gerard rowed 40 or more miles a day enroute to his goal of becoming the first person to row the 6,300 miles from Choshi, Japan to the United States. He arrived in Ilwaco, Washington on November 21st after being at sea for 134 days. He also is the first (and only) person to row solo across the Atlantic from Cape Cod to France. That took him 72 days. (The Pacific Ocean is twice as wide as the Atlantic.)

D'Aboville used global positioning satellites to confirm his location. "A ham radio kept the mariner in touch with France and the network of pacific radiomen, including Fred Boehme in Hawaii." *TNX W5YI Report, Vol. 13, Issue #24.*

# No-Code a Winner

No-code has become the biggest growth incentive to amateur radio since the inception of the service itself. So says the FCC in issuing some dramatic statistics on the impact of the new license.

During September, the FCC says that it issued 1,680 new Technician Class licenses, compared to only 679 Novice tickets, for a total of 2,407 that month. And this was the lowest figure since last February when the no-code Technician class was made available. But it's not that fewer applicants were applying that month; rather, the FCC processing facility simply could not handle the number of no-code applications coming in. The *ARRL Letter* reports that the backlog of unprocessed applications grew by another 1,200 during September.

All in all, for the 1990 federal fiscal year ending September 30, there were an astonishing 38,363 new amateur licenses issued and 30,825 upgrades. In 1989, there were 26,134 new licensees and 29,699 upgrades. During 1991, 65% of all newcomers entered as code-free Techs; only 33% entered as Novices.

These numbers do not tell the whole story, as according to other figures, there are some 5,000 applicants taking the no-code Technician test every month. As a result, next year's cumulative fiscal year figures should go right through the roof. *TNX Westlink Report, No. 615 via Newsline, and W5YI.*

# 30 Years of OSCAR

The first OSCAR amateur radio satellite was born on December 12, 1961. OSCAR-1 ("1961 Alpha-Kapa 2") was launched with a THOR-AGENA-B rocket from Vandenberg/USA into an 81 degree elliptical orbit with an apogee of 471 km.

OSCAR-1 had only a little battery and a 0.1 watt telemetry beacon on 145 MHz, and no solar cells!

Last signals were copied around January 3, 1962. On January 31st of that same year, OSCAR-1 burned up during reentry.

At that time, the OSCAR Group in the U.S. had received more than 5,200 signal reports from over 570 radio amateurs in 25 countries. *TNX Space-News via MCImail, Dec. 23, 1991, and Peter DB2OS via OSCAR-14.*

# Kenwood K.I.D.S.

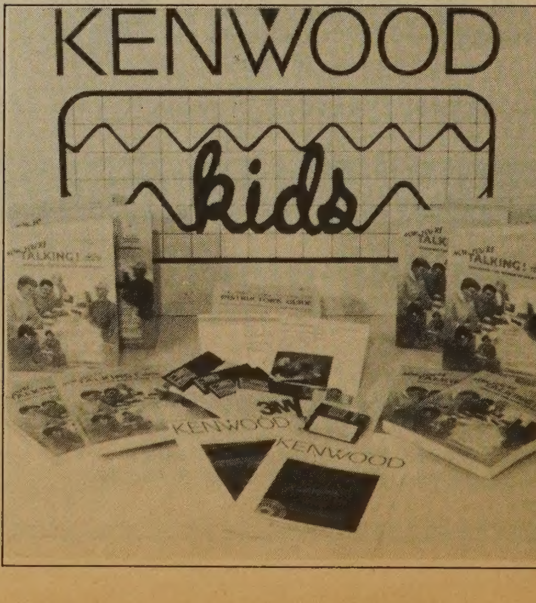
Kenwood has come up with an exciting program called Kenwood K.I.D.S. to help young people discover the fun of amateur radio. Kenwood asks amateur radio clubs to co-sponsor a local school, scout troop, or youth group with the Kenwood K.I.D.S. program.

As co-sponsor, your club provides local assistance, elmering the youth group, while Kenwood provides the educational materials and prizes. Each new ham sponsored under the program will receive a $25 gift certificate from Kenwood. For every 10 Kenwood Kids licensed, your club will receive 10 $25 gift certificates.

All clubs that sponsor at least one group of 10 Kenwood Kids by March 1, 1992, will be entered in a drawing for Kenwood's TS-950SD top of the line transceiver. And each of the youth clubs with 10 or more new members will have a chance to win one of 10 complete stations consisting of: a TS-140S transceiver, PS-430 power supply, AT-250 antenna tuner, and MC-60A microphone.

Write Kenwood for a Kenwood K.I.D.S. package containing: 10 copies of *Now You're Talking*, one copy of the ARRL "Novice/Technician Instructor's Guide," a certificate for one copy of Kenwood's Ham Windows software (a new computer program that makes the computer an extension of the HF rig, while also teaching science, geography, and social studies), and the Kenwood K.I.D.S. program outline and promotional materials, including forms to claim gift certificates and enter the prize drawings.

You can add new members to your club, earn Kenwood's gift certificates, and maybe win a TS-950SD. Mike Forsyth, Kenwood's Western Regional Sales Manager of amateur radio products, expects that the response to the program will help build a stronger amateur radio community. For an application, write Kenwood U.S.A. Corporation, Kenwood K.I.D.S. Program, P.O. Box 22745, Long Beach CA 90801-5745. *TNX Mike Forsyth of Kenwood.*



**The Kenwood K.I.D.S. package will be sent to the first 1,000 clubs responding with an application.**

**Radio Fun**

**february 1992**
**issue #7**

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# letters

**Ken Balough KK4TZ, Seminole FL** I just picked up my first copy of *Radio Fun* magazine (it was a freebee at the Tampa Hamfest), and I am thoroughly enjoying it. Our hobby has needed a magazine such as this for years. I've already mailed in my subscription form.

Although I've had my ticket for 25 years, my interest in amateur radio is reinforced by your publication. Reading the articles in *Radio Fun* are more my speed. I don't subscribe to *73*, *Ham Radio* [defunct], *CQ*, or *QST*. I have no desire to become an electronics whiz, I just enjoy the hobby.

I especially enjoyed the article from Issue #2 on "Flea Market Bargains." Many good memories returned from several of the radios listed in the article. I'm unable to spend a lot of bucks on the hobby, and that article really hit home, as I operate whatever boat anchor junk I can get on the air. Actually, I feel more accomplishment when I work other hams with my rubber-banded Scotch-taped equipment than I do with a brand-new $2,000 rig.

**Pat Carter KA6IRS, FAXED** Recently I was pleased to receive the November issue of *Radio Fun*. This is a great publication, and all involved should be proud. Although technically I have been a ham for 12 years, I just in the last 18 months became an active member. At that time, I became involved with the Naval Postgraduate School Amateur Radio Club, and I have found much satisfaction and enjoyment during this time. This club is extremely active, and a vital contribution to our community.

**Anthony Shook KD4BRS, Reinsville NC** Thanks to a local ham, I was able to pick up my Novice ticket last summer. This in itself is not so amazing. What adds to it is that I am currently in prison. Walt was teaching a course in basic electronics, and offered to prepare anyone interested in getting an amateur radio license. We had a great time, and within two or three months I had my Novice ticket! While Walt was here, we were not able to do much in the way of transmitting (not able to get permission to put up an antenna), but with an "interesting" variety of wire antenna, for several days we were able to pick up ZL, DU, DL, clear as next door, on 40 meters.

Apparently as a result of passing the Novice exam, I have been receiving *Radio Fun* since the first issue (good timing on my part!). As I remain in prison, I am unable (at present) to obtain my own equipment or QSO with others. This is a bit frustrating, but *Radio Fun* has helped me keep in touch. When Walt came in to teach, he would bring his copies of *73 Magazine*, and I really enjoyed them. *Radio Fun* seems aimed more at beginners, and I especially have enjoyed the section by Gordon West. Thank you for *Radio Fun*. Please continue my subscription, and bill me as needed. Hoping to QSO with you soon.

**Charlie Pemberton N1DMZ, Woodmont CT** The Coastline Amateur Radio Association (CARA) and I, as a subscriber, wish to congratulate *Radio Fun* and staff for giving us another new outlook in the wonderful world of amateur radio. It is informative. . . easy reading . . . and your layout is super. Again, our applause, and we thank you.

At the request of our vice-president, Gary Burlock NB1M, I would like to mention test session dates for 1992: 2-23; 3-29; 4-26; 5-31; 6-28; 7-26; 8-30; 9-27; 10-25; 11-22; 12-20. Walk-ins are welcome. All exams are at noon in the Fowler Bldg. in Milford, Connecticut. Don't forget to bring your current original license plus a copy of it, a CSCE and copies, and an ID (photo or driver's license). RF

# Mir Operators Now Multi-Op/Multi-TX

There has been another amateur radio first accomplished aboard *Mir*. Both Aleksandr U4MIR and Sergej U5MIR have operated simultaneously on two different stations. Ray Soifer W2RS reports working U5MIR on 145.55 FM voice. During the QSO, Ray was instructed to QSY down 50 kHz to 145.50, and there found U4MIR also on FM. The new ICOM rig brought up recently for packet operation is apparently doing double duty. The cosmonauts are apparently becoming more comfortable with the equipment, and are experimenting with new configurations.

Jay Apt N5QWL, one of the five hams aboard the STS-37 mission, reports that the cosmonauts on *Mir* observed the launch of the *Atlantis* on its STS-44 mission from their vantage point in space, and reported the sighting to the listeners down below via amateur radio. *TNX Westlink Report 615 and W2RS, W3XO, and N5QWL via ANS.*

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# Professionally Prepared Projects

## *Make it look as good as it works.*

by James Melton

Everyone who has designed and built an electronic project knows that the hardest part of the design is getting the schematic down on paper. The second hardest thing is to finish the project so that it has a professional feel and appearance. My discipline on the schematics is no better than anyone else's, so I would like to address the second subject in this article: front panels and the "feel" of a project.

No matter how hard you have worked on a project, no matter what it does, and no matter what engineering marvels it contains, when you show it to your peers (or even your spouse!), they will generally be able to tell immediately that it is not a commercial piece. Why? Because it is too light, because it is laid out inconveniently for use, and because the front panel has no marking on it to show what it does!

THIS IS BAD! You can make a project that is virtually indistinguishable from a commercial product if you give it a little thought and a little time. The rewards of impressing your colleagues pale in comparison to hearing, "That really looks neat!" from someone who is not normally impressed with electronics.

### Where to Start

First, let's cover some of the basics of any electronic project. All projects *do* something. All projects require some interaction from the user. All projects are subject to adjustment (or fiddling). In all these cases, you will be holding or looking at the box. The box you build your project in must have a certain "heft" or "feel."

In most electronic products built for consumer use, weight is not the primary concern, but it is still a factor in the design. If a product is not heavy enough or lacks a certain density, the consumer will not have the same confidence in it, whether the product is electronically great or not. Hewlett-Packard makes some of the best test equipment in the world, and I can assure you they build it solid—some of their equipment is solid aluminum everywhere that isn't electronic parts!

Your projects are the same—they don't have to be as heavy as a ton of bricks, but they do have to be stable enough to withstand the plugging or unplugging of banana jacks, or having a switch pushed off or on, without moving all over the workbench. I know that this is a little hard to believe, but if you build a lightweight project and sit it side-by-side with an identical project that has the extra weight, most people will prefer using the heavier project. Try this experiment for yourself—I promise it does work this way!

Two things are necessary to accomplish this. First, the box needs to have rubber feet. These will help it stay still on the bench, keep it from scratching the surfaces it sits on, and raise it a little from the tabletop (this will make it look better). The feet can be attached by using a small machine screw with a nut, or by gluing the foot on.

Second, if your project is not weighty enough on its own, either from the batteries or transformers included in the project, then you will need to add weight. I know this goes against the grain, but if you are not building something that goes in an airplane, then extra weight will generally not be a concern. On the other hand, not enough weight will mark your project as a "lightweight."

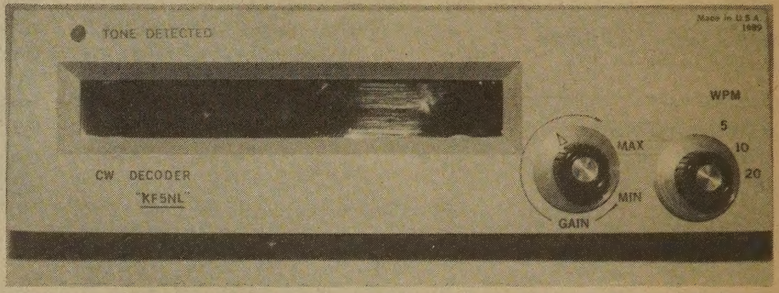

**Photo C. This piece of gear can be used by any ham. The labels make it clear what each control or indicator is for.**

Extra weight can be added in several forms. You can mount stacks of washers in the box, anchored to the bottom so the stud will not show, or you can add lead fishing weights, epoxied to the bottom of the box.

### The Second Step: Appearance

The second step, improving the project's appearance, is much more important than the density of the project. How the front panel looks is 90% of the battle. There are several methods of marking projects. The most often used is probably the "acid" pen. This pen makes relatively permanent markings on both metal and plastic, and is OK only (by my reckoning, anyway) if you are in a major hurry to get a really simple project working. See Photo A. While you can see that this method obviously does work, I almost wish that I had not labeled it at all!

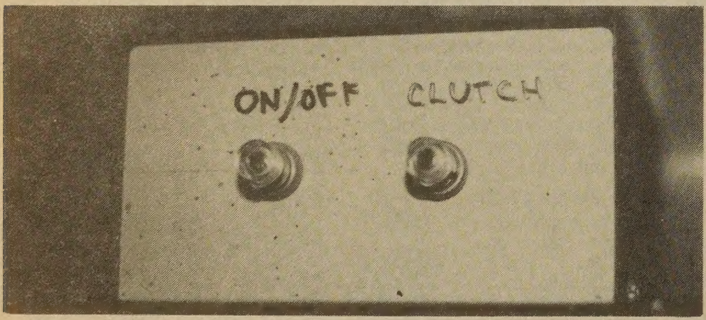

**Photo A. This is a control box for a motor/compressor combination. I wish I had not labeled it at all!**

### DYMO Tape

Another method of marking front panels is with embossing machines. These hand-held embossers make a raised, white letter on a strip of variously-colored plastic which has adhesive on the back. This method is much better than an acid pen in appearance but is not as permanent, and still labels your project as something less than professional. Photo B is an example of a project done with embossing tape. Look familiar to you? Can you tell what this box is or does? What does that knob on the far right do? I don't know either—I can't remember!

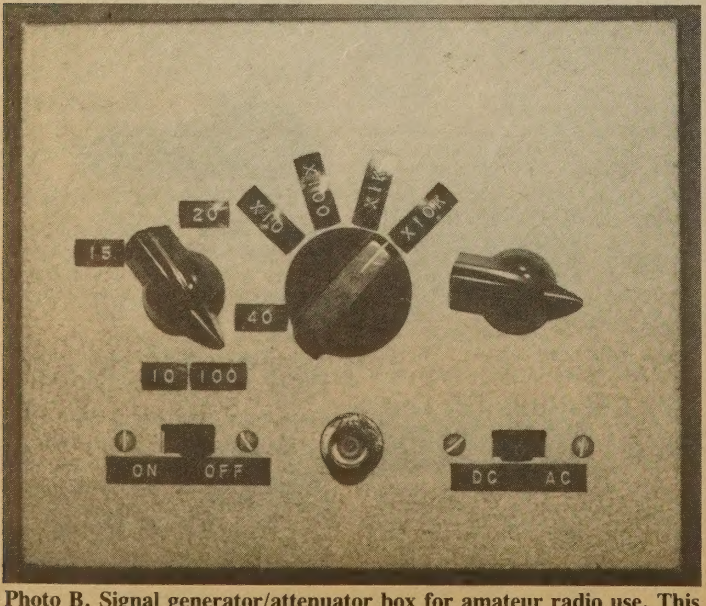

**Photo B. Signal generator/attenuator box for amateur radio use. This labeling does look better than the permanent marker, but not a whole lot!**

### Dry Transfer

A third method, which begins to border on professional, is to use dry transfer rub-on letters and markings. These come in all sizes and type styles, and in all kinds of shapes and lines to use for volume controls, switches jacks and just about anything else you might need on a panel. There are several things you might want to consider when using these dry transfer labels. First, and maybe the most important, is to use the labels that come in actual "words" (only use the individual lettering when you have no other alternative). Second, think about the contrast you are trying to achieve. The dry transfers come in both black and white, so for a particular project you might decide to paint the box white and use black lettering, or if the box is aluminum you might think about polishing it to remove scratches and use black symbols. See the box shown in Photo C for an example of this method.

When you are through, be sure and use some clear acrylic spray paint to protect the dry transfers on the front surface. They are very fragile and will rub off very easily. In fact, if you make a mistake while you are lettering your box, just use a piece of cellophane tape pressed over the mistake to lift it right off the panel. If you use several thin coats of the clear spray instead of one heavy coat, the letters will be less likely to lift away from the surface and the coating will also be much tougher.

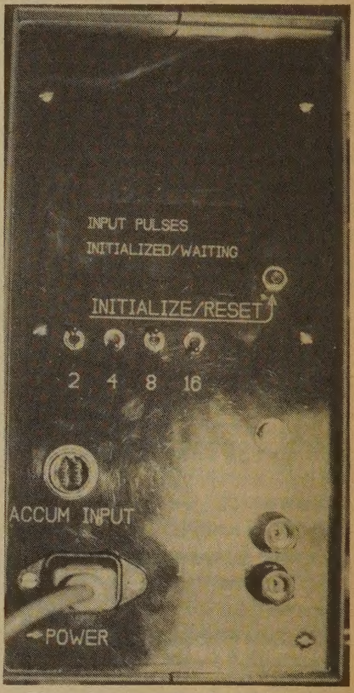

**Photo D. A professional job on this piece of equipment identical to a commercial piece of equipment.**

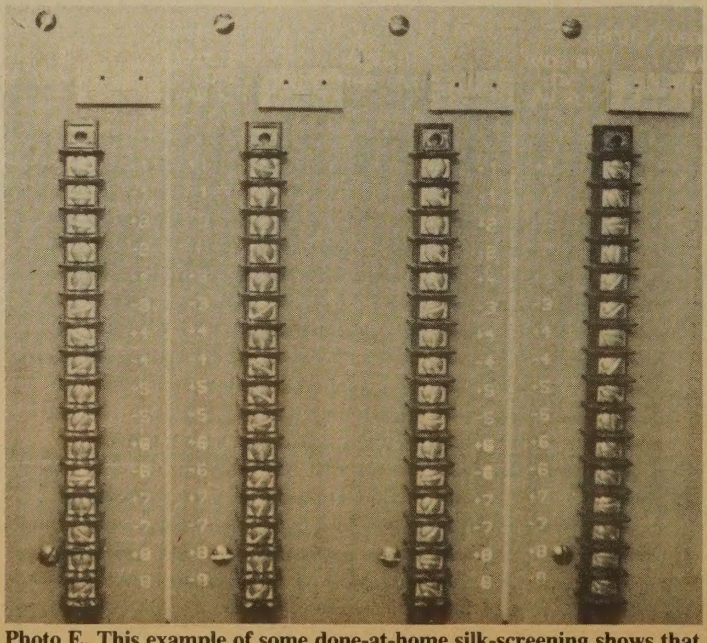

**Photo E. This example of some done-at-home silk-screening shows that there is a lot of room for improvement.**

### Line Negatives

For a truly professional-looking front panel, you can use methods that are almost identical to the methods used to generate printed circuit boards. The first step is to draw a picture, either on a drafting table or using a computer, of the front panel of your dreams. You can go wild here. Use different size letters for different areas of the board. Use groupings of lettering styles to put similar functions in a cohesive area. Draw boxes around the groups of functions. Put some instructions on the front. Put a "MADE IN USA" label on it in small type near the bottom. Put your name on it. Put the name of the project in really big letters right near the top left-hand side. This is your chance! Look at the front panels of some equipment you like.

See what they have done and do something similar.

Think ahead. What you are going to do with this drawing is have a “line negative” made up at the print shop. This will invert the black/white you are using on the paper and produce clear/black on the piece of film you get back. This is an important part to think about: Anywhere you have a line will be a clear place on the film. This means that when you lay the film down on the front panel, the panel color will show through. You can paint different areas of the panel different colors. This will produce very good-looking, extremely professional front panels.

In addition to the painted front panel, there is a good chance that some of your projects will have LEDs, or even seven-segment LEDs. (A friend of mine says, “All projects must incorporate a switch and an LED, even if the switch only turns on the LED!”) If your project has an LED display, consider the opening that you will be showing it in. One very nice way to finish out an LED display is to completely black in the area where it is going to be on your original artwork. This will produce a clear area on the line negative, and onto this clear area you need to glue a piece of red film. Now, since the interior of your box is dark, when the device is not on this area will appear black, but when you turn it on and the LEDs light up they will show through the window. This looks very good on a project. See Photo D for an example of this method. Note also that the holes where the LEDs are going to shine do not have to be round—rectangles, squares, ovals, or even “gear” shapes might be appropriate to what you are doing. Do something that is eye-catching or will leave an impression.

There are several ways to mount the line negative on the front panel. The first way is to glue it down, using spray adhesive. This way will work, but it is not easy to get the film down flat on the glue without some work. Another way is to use rubber cement or a glue stick on the back of the piece of film and put it only in the areas that are completely black.

The best way is to cut a piece of 1/8" (or 1/16", if available) Plexiglas™ that is the same size as the front panel. Sandwich the film between the box and the Plexiglas, drill the holes you need for the parts that stick through, and then mount all the components on the front panel. The parts sticking through will generally be enough to hold everything together, but if not you can use some small pan-headed machine screws to do the job. A front panel made with this method is certainly high enough quality to sell to the public.

### One Last Method

If you have followed the “line negative” procedure so far, there is one other method that will produce a very unusual front panel. Use the line negative you have to produce a printed circuit board on the thinnest PC material you can find. Make sure that it is glass-epoxy board for strength. When you have the board finished you can either polish and clear-coat the front as in the other (dry transfer) method, or you can artificially “tarnish” the copper, using a paste made of sulfur powder and water. Apply the paste and wait for the desired amount of “black” tarnish to appear. When it has, wash the panel and let it dry, then spray it with the clear coat again to protect the tarnished surface.

Now for the good part: Put a small lamp inside your project. Now, when you turn it on, everywhere the copper was removed the light will show through, illuminating the writing, markings and symbols.

You can also use this method with copper used in place of dry transfer lettering. It will be much more durable and will look great.

### Don't Try This At Home

There is one other method that I will mention, the true professional method. This is silk-screening. See Photo E. When you silk-screen, you use a fine screen (now generally made of some synthetic fibers instead of silk) that has been impregnated with a photochemically reactive substance. When you expose the screen through a negative, the parts where light shines through undergo a change that makes them “soft” to a solvent. When you use the solvent, these parts are rinsed away.

You now have a screen that you lay on top of the front panel. Then apply paint to the screen and squeegee it through the holes in the screen, depositing it on the panel. This process may be more than you are willing to go through for one project. It involves a lot of time and not an inconsiderable amount of money. (Maybe there is a market out there for a cheap, single-use silk-screen kit?)

I hope that I have given you some reasonable answers to the question of how to produce a really good-looking and good-feeling project. Your time spent making these projects look good and feel right will not be wasted. RF

*Contact James Melton at 2747 Wentworth Drive, Grand Prairie TX 75052.*

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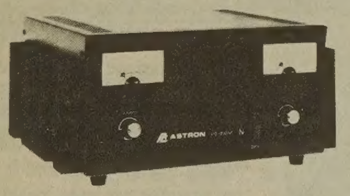

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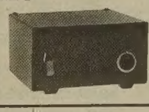

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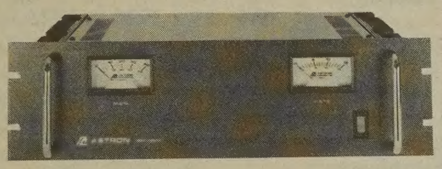

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| RS-5A | | • | 4 | 5 | 3½ × 6⅛ × 7¼ | 7 |
| RS-7A | • | • | 5 | 7 | 3¾ × 6½ × 9 | 9 |
| RS-7B | • | • | 5 | 7 | 4 × 7½ × 10¾ | 10 |
| RS-10A | • | • | 7.5 | 10 | 4 × 7½ × 10¾ | 11 |
| RS-12A | • | • | 9 | 12 | 4½ × 8 × 9 | 13 |
| RS-12B | | • | 9 | 12 | 4 × 7½ × 10¾ | 13 |
| RS-20A | • | • | 16 | 20 | 5 × 9 × 10½ | 18 |
| RS-35A | • | • | 25 | 35 | 5 × 11 × 11 | 27 |
| RS-50A | • | | 37 | 50 | 6 × 13¾ × 11 | 46 |

RS-M SERIES

MODEL RS-35M

| MODEL | Continuous Duty (Amps) | ICS* (Amps) | Size (IN) H × W × D | Shipping Wt. (lbs.) |
|---|---|---|---|---|
| • Switchable volt and Amp meter | | | | |
| RS-12M | 9 | 12 | 4½ × 8 × 9 | 13 |
| • Separate volt and Amp meters | | | | |
| RS-20M | 16 | 20 | 5 × 9 × 10½ | 18 |
| RS-35M | 25 | 35 | 5 × 11 × 11 | 27 |
| RS-50M | 37 | 50 | 6 × 13¾ × 11 | 46 |

VS-M AND VRM-M SERIES

MODEL VS-35M

• Separate Volt and Amp Meters • Output Voltage adjustable from 2-15 volts • Current limit adjustable from 1.5 amps to Full Load

| MODEL | Continuous Duty (Amps)<br>@13.8VDC | @10VDC | @5VDC | ICS* (Amps) @13.8V | Size (IN) H × W × D | Shipping Wt. (lbs.) |
|---|---|---|---|---|---|---|
| VS-12M | 9 | 5 | 2 | 12 | 4½ × 8 × 9 | 13 |
| VS-20M | 16 | 9 | 4 | 20 | 5 × 9 × 10½ | 20 |
| VS-35M | 25 | 15 | 7 | 35 | 5 × 11 × 11 | 29 |
| VS-50M | 37 | 22 | 10 | 50 | 6 × 13¾ × 11 | 46 |
| • Variable rack mount power supplies | | | | | | |
| VRM-35M | 25 | 15 | 7 | 35 | 5¼ × 19 × 12½ | 38 |
| VRM-50M | 37 | 22 | 10 | 50 | 5¼ × 19 × 12½ | 50 |

RS-S SERIES

MODEL RS-12S

• Built in speaker

| MODEL | Colors<br>Gray | Black | Continuous Duty (Amps) | ICS* Amps | Size (IN) H × W × D | Shipping Wt. (lbs.) |
|---|---|---|---|---|---|---|
| RS-7S | • | • | 5 | 7 | 4 × 7½ × 10¾ | 10 |
| RS-10S | • | • | 7.5 | 10 | 4 × 7½ × 10¾ | 12 |
| RS-12S | • | • | 9 | 12 | 4½ × 8 × 9 | 13 |
| RS-20S | • | • | 16 | 20 | 5 × 9 × 10½ | 18 |

CIRCLE 16 ON READER SERVICE CARD

*ICS—Intermittent Communication Service (50% Duty Cycle 5min. on 5 min. off)

# Repeater Operating Do's and Don't's

DO let the repeater tail drop between transmissions. This lets the timer reset, and gives others the opportunity to break in.

DON'T ever acknowledge any unidentified transmissions, or stations you think are illegal. If you do, you're giving them the attention they're looking for.

DO immediately recognize “Call Please.” This is a way of indicating you wish to contact a station and communicate briefly in order to arrange to move to another frequency.

DON'T say “Break” or “Call Please,” if you merely wish to join a conversation in progress. Just say your callsign during a pause.

DO try to be a good listener. If you're unfamiliar with a topic being discussed, use the opportunity to listen, ask questions, and learn.

DON'T discuss the same topic time and time again. Others who are listening appreciate variety. Too much of even a good thing can quickly drive other users to another frequency, or to the “off” switch on their radio.

DO try to limit the amount of time you spend on the air daily. The repeater is like a telephone party line: the more you talk, the more you discourage others from initiating their own calls and conversations. Keep an “internal timer” running in your mind, and consider how many minutes per day constitutes your fair share of operating time.

DON'T tie up the repeater for local or base station conversations. The Boston repeater *[for example]* is a wide-area coverage system; many people benefit from its operation. After establishing contact, move to a simplex frequency, or a local-coverage repeater if possible. Give mobiles and portables priority for the repeater's use.

DO get into the habit of asking, “Is the repeater (frequency) in use?” before making a call or announcing that you're listening. It isn't enough to merely listen for five or 10 seconds. You could find yourself interrupting an ongoing conversation, or even a traffic accident report.

DON'T use excessive ham “jargon.” Say, “My name is—” rather than, “handle (personal) on this end is—” Similarly, avoid Q-signals, which were invented for Morse code communication. Avoid the use of nonexistent words and phrases, such as, “I'm destinated.” Just say, “I'm at my destination.” And stay away from cute phonetics that may confuse non-native English speakers (and native English speakers, for that matter!). Use the approved international phonetics if you must use phonetics. Speak with normal inflection and a normal tone of voice, as if you were talking to someone face-to-face.

Finally, DO act toward others on the air as you would want them to act toward you. We all deserve to be treated with respect and kindness. But we all have different levels of expertise. Don't be quick to judge when the other person fails to measure up—we were all new to this hobby once. *TNX SPARC, K9HI, Dec. '91.*

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# Early Amateur Long Distance Wireless

by Frank Lyman Jr. W1KD (ex-1KC/U1KC)

**Photo A. The 150-foot-tall wooden lattice tower and mast.**

Amateur wireless practice in the early 1920s was very different from what it is today. To begin with, the transceiver, with both the transmitter and the receiver automatically tuned to the same frequency, was unheard of. In most cases, both the transmitter and the receiver had to be home-built. This was very definitely the case as the DX stations moved to higher and higher frequencies because there wasn't any commercially-built equipment available for those shorter wavelengths.

The transmitters were relatively simple, using just one tube as a self-excited oscillator in a Hartley or Colpitts circuit. The plate power was often straight AC 60 cycles. The antenna was normally fed directly to a transmit/receive switch, with no transmission line. Counterpoises were often used because they tended to give higher antenna current readings.

The receivers were normally regenerative units which gave high gain and produced nice notes for code signals, with no extra complications. These receivers were extremely broad in their tuning, which probably helped in finding other amateur signals. There was no image problem, as superheterodyne receivers were seldom used. There was no limitation on amateur bands because nobody else used wavelengths shorter than 200 meters. Everything was OK as long as one didn't intrude on the longer wavelengths used by ships and broadcast stations. Amateur telephone stations were relatively rare and most amateurs stuck to code communication. This was particularly true when they were seeking long distance circuits.

In 1920, amateurs used the longest wavelengths they were licensed to use, approximately 200 meters. However, when trans-Atlantic contacts started, some shorter wavelengths seemed to work better. Gradually, hams began to use wavelengths down to 80 meters.

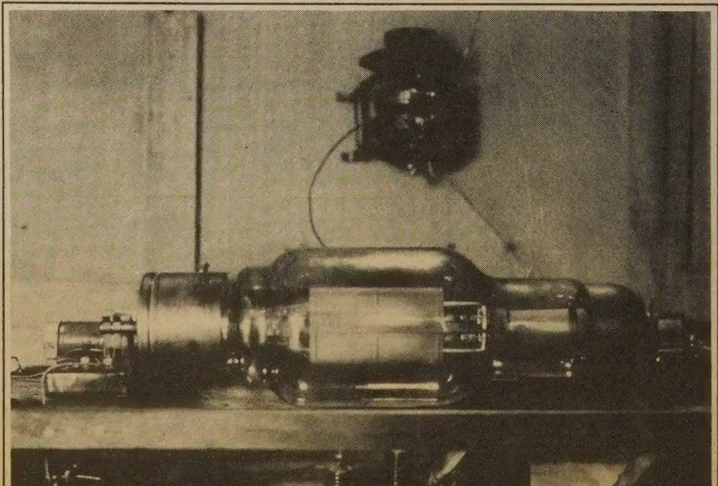


**Photo B. The RCA 204 tungsten-filament single-tube transmitter.**

The concept of optimizing things by using the shortest wavelengths on which good contact could be established had not entered our understanding in 1923. It did not work for any single station to move to a new shorter wavelength because there was nobody to communicate with until others moved at the same time. As I remember the events, we had found that 80 to 90 meters worked out well on North America to Europe contacts, and it was practical to make our large transmitting tubes work in that band. Also, we had been able to make the regenerative receivers of that day work in the 80 to 90 meter range.

Basically, we had gotten to using wavelengths shorter than 100 meters, and a significant number of amateurs were using such wavelengths all around the world in 1924. These moves in frequency were a worldwide phenomenon. If we heard a European amateur on 90 meters we would try to tune up our large oscillator tube on that wavelength and contact him.

### Wireless: 1920 to 1925

Brooklyn, New York, was an interesting place for me and my older brother Joe to grow up with an interest in wireless. We each bought crystal receivers at a small electrical store on Court Street, belonging to Tony Muserofetti. After we had had the crystal sets for a month or so, and had heard the strong code signals of NAH at the Brooklyn Navy Yard and various ships around New York, we decided that we needed more advanced equipment. We went back to the electrical store and bought an audiotron made by DeForest. This required a storage battery to light the filament, and a “B” battery to make the electrons from the filament travel to the plate.

This didn't change the signals received much. NAH dominated the area with its 5 kW spark transmitter about two miles away, there were various fainter ships, and occasionally a telephone signal. One of the first phones was that of a local dentist by the name of Dr. Parker, who had used his skill at dentistry to build himself a beautiful phone transmitter. Once in awhile we heard phone tests from a transmitter at Deal Beach, New Jersey, which was operated by the American Telephone and Telegraph Company. There was no broadcasting until WJZ showed up. In late 1920 or early 1921 I got an Adams Morgan regenerative receiver which, with its regeneration, had remarkable sensitivity. All along during this period, my brother Joe and I were learning the code.

In the spring of 1921 I was at our family house in Northampton, Massachusetts. I convinced a local wireless dealer by the name of Glenn Sabin that I could handle 10 words of Morse code and knew the answers to a number of technical problems. Mr. Sabin was kind enough to fill out various forms and forward them to the radio inspector in Boston, Charles Kolster. In due time I received my first radio license, with the call 1KC. At about the same time my brother Joe, who was in Brooklyn, took an examination at the New York custom house and received a license with the call 2CGY.

Joe came to Northampton and we quickly set up a transmitter he had built using two 5-watt tubes, with an antenna between two pine trees. The first contact I made was with 1XP in Athol, Massachusetts, and it seemed like real long distance communication.

### More Power

We soon got a secondhand 500-volt DC motor set up in the cellar as a generator for Joe's transmitter, and we were really on the air. However, with only a 500-volt generator, our power was way too low for any aspiring amateurs. We persuaded Dad to finance a 1,500-volt Esco motor generator, ordered from the factory in Connecticut. The order went wrong and the generator ended up with another Lyman in Easthampton. This resulted in a terribly distressing delay for us. By the time the generator finally arrived we had gotten hold of a 50-watt transmitting tube and were beginning to have some real power. This was about Christmas time in 1922, and we moved the radio shack to the attic to allow the guest room to again be used for guests.

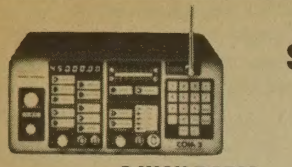
The wavelength we were still using at that time was just below 200 meters, the legal limit. Long distance contacts around the U.S. and Canada began coming in at a great rate. Soon we began hearing that shorter wavelengths were better for distant calls. We made numerous trips to Hartford, Connecticut, and talked with the fellows who put out *QST* magazine. We also called on Johnny Reinertz, who lived near Hartford and had designed a number of state-of-the-art receivers. In that day and age everything had to be built at home as there was no commercial shortwave gear available. We copied the Reinertz receivers and they worked well.

In late 1923 our father agreed to get us a wooden tower with a mast hoisted up through the center. The lattice tower was to be 84 feet tall and the mast 66 feet above the tower, giving a total height of 150 feet. Joe and I had figured that this would be just about right for 200 meters, and it certainly worked mighty well. It made Europe an easy contact, and the DX kept piling.

Somewhere about this time we got hold of a synchronous rectifier. This was a charming device which, with careful adjustment of the control arm, you could set for minimum sparking of the rotary switch, converting AC to DC with the transmitter sounding pretty much like a spark transmitter.

*Continued on page 12*

# RAMSEY ELECTRONICS



## COM-3 $279500

## 2 WAY RADIO SERVICE MONITOR

COM-3, the world's most popular low-cost service monitor. For shops big or small, the COM-3 delivers advanced capabilities for a fantatic price—and our new lease program allows you to own a COM-3 for less than $3.00 a day. Features •Direct entry keyboard with programmable memory •Audio & transmitter frequency counter •LED bar graph frequency/error deviation display •0.1–10.000 µV output levels •High receive sensitivity, less than 5 µV •100 kHz to 999.9995 MHz •Continuous frequency coverage •Transmit protection, up to 100 watts •CTS tone encoder, 1 kHz and external modulation.

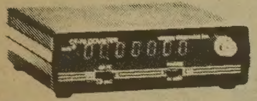
## RSG-10 $249500

## SYNTHESIZED SIGNAL GENERATOR

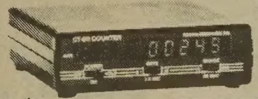
Finally, a low-cost lab quality signal generator—a true alternative to the $7,000 generators. The RSG-10 is a hard working, but easy to use generator ideal for the lab as well as for production test. Lease it for less than $3.00 a day. Features •100 kHz to 999 MHz •100 Hz resolution to 500 MHz, 200 Hz above • –130 to +10 dBm output range •0.1 dB output resolution •AM and FM modulation •20 programmable memories •Output selection in volts, dB, dBm with instant conversion between units •RF output reverse power protected •LED display of all parameters—no analog guesswork!

## FREQUENCY COUNTERS

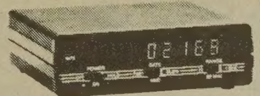
### CT-70 7 DIGIT 525 MHz



### CT-90 9 DIGIT 600 MHz



### CT-125 9 DIGIT 1.2 GHz



Ramsey Electronics has been manufacturing electronic test gear for over 10 years and is recognized for its lab quality products at breakthrough prices. All of our counters carry a full one-year warranty on parts and labor. We take great pride in being the largest manufacturer of low-cost counters in the entire U.S.A. Compare specifications. Our counters are full-featured, from audio to UHF, with FET high impedance input, proper wave shaping circuitry, and durable high quality epoxy glass plated-thru PC board construction. All units are 100% manufactured in the U.S.A. All counters feature 1.0 ppm accuracy.

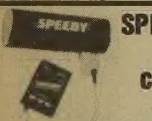
### NEW CT-250 2.5 GHZ

### ACCESSORIES FOR COUNTERS

| | |
|---|---|
| Telescopic ship antenna—BNC plug, WA-10 | $11.95 |
| High impedance probe, light loading, HP-1 | $16.95 |
| Low-pass probe, audio use, LP-1 | $16.95 |
| Direct probe, general purpose use, DC-1 | $16.95 |
| Tilt bail, elevates counter for easy viewing, TB-70 | $ 9.95 |
| Rechargeable internal battery pack, BP-4 | $ 9.95 |
| CT-90 oven timebase, 0.1 ppm accuracy, OV-1 | 59.95 |

### ALL COUNTERS ARE FULLY WIRED & TESTED

| MODEL | FREQ. RANGE | SENSITIVITY | DIGITS | RESOLUTION | PRICE |
|---|---|---|---|---|---|
| CT-50 | 20 Hz–600 MHz | <25 mV to 500 MHz | 8 | 1 Hz, 10 Hz | $189.95 |
| CT-70 | 20 Hz–550 MHz | <50 mV to 150 MHz | 7 | 1 Hz, 10 Hz, 100 Hz | $139.95 |
| CT-90 | 10 Hz–600 MHz | <10 mV to 150 MHz<br><150 mV to 600 MHz | 9 | 0.1 Hz, 10 Hz, 100 Hz | $169.95 |
| CT-125 | 10 Hz–1.25 GHz | <25mV to 50 MHz<br><15 mV to 500 MHz<br><100 mV to 1 GHz | 9 | 0.1 Hz, 1 Hz, 10 Hz | $189.95 |
| CT-250 | 10 Hz–2.5 GHz<br>typically 3.0 GHz | <25 mV to 50 MHz<br><10 mV to 1 GHz<br><50 mV to 2.5 GHz | 9 | 0.1 Hz, 1 Hz, 10 Hz | $239.95 |
| PS10B Prescaler | 10 MHz–1.5 GHz, divide by 1000 | <50 mV | Convert your existing counter to 1.5 GHz | | $89.95 |



## SPEED RADAR $89.95 complete kit SG-7

New low-cost microwave Doppler radar kit "clocks" cars, planes, boats, horses, bikes or any large moving object. Operates at 2.6 GHz with up to 1/4 mile range. LED digital readout displays speed in miles per hour, kilometers per hour or feet per second! Earphone output allows for listening to actual doppler shift. Uses two 1-lb coffee cans for antenna (not included) and runs on 12 VDC. Easy to build—all microwave circuitry is PC stripline. Kit includes delivery. ABS plastic case with speedy graphics for a professional look. A very useful and full-of-fun kit.

## BROADBAND PREAMP

Boost those weak signals to your scanner, TV, shortwave radio or frequency counter. Flat 25 dB gain, 1 to 1000 MHz. 3 dB NF. BNC connectors. Runs on 12 VDC or 110 VAC.

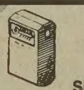
| | |
|---|---|
| PR-2, wired, includes AC adapter | $59.95 |

## 2M POWER AMP

Easy to build power amp has 8 times power gain, 1W in, 8W out, 2W in, 16W out, 5W is for 40W out. Same amp as featured in many ham magazine articles. Complete with all parts, less case and T-R relay.

| | |
|---|---|
| PA-1, 40W pwr amp kit | $29.95 |
| TR-1, RF sensed T-R relay kit | $ 8.95 |

## FM WIRELESS MIKE KITS



FM-3 SHOWN

Pick the unit that's right for you. All units transmit stable signal in 88–108 MHz FM band up to 300′ except for hi power FM-4 that goes up to ½ mile.

| | |
|---|---|
| FM-1, basic unit | $ 5.95 |
| FM-2, as above but with added mike preamp | $ 7.95 |
| FM-4, long range, high power with very sensitive audio section, picks up voices 10′ away | $14.95 |
| FM-3, complete unit includes case, battery, switch, antenna, and built-in condensor mike. Excellent fidelity, very small, kit | $16.95 |
| FM-3WT, as above, but fully wired and tested | $19.95 |
| SMC, miniature sensitive mike cartridge for FM-1, 2, 4 | $ 2.95 |

### MICROWAVE INTRUSION ALARM

A real microwave Doppler sensor that will detect a human as far as 10 feet away. Operates on 1.3 GHz, and is not affected by heat, light, or vibrations. Drives up to 100 mA output, normally open or closed, runs on 12 VDC.

| | |
|---|---|
| Complete kit MD-3 | $16.95 |

### MUSIC MACHINE

Neat kit that will produce 25 different classical and popular tunes, plus 3 doorchime sounds. Lots of fun for doorbells, shop, or store entrances, car horn, music boxes, etc. Runs on 9V battery or wall transformer. Excellent speaker volume and adjustable tempo and pitch. Add our case set for a handsome finished look.

| | |
|---|---|
| Complete kit, MM-5 | $24.95 |
| Case + knob set, CMM-5 | $12.95 |

### PACKET RADIO

Commodore C64/128 packet radio interface. Uses famous German Digicom software. Features EXAR IC chip set for reliable operation—runs HF or VHF tones. Includes FREE disk software. PC board, all necessary parts and full documentation.

| | |
|---|---|
| Complete kit, PC-1 | $49.95 |

### LO NOISE PREAMPS

Make that reciever come ALIVE! Small size for easy installation with Hi-Q tuned input for peak performance. Excellent gain and noise figure—guaranteed to improve reception! Specify band: 2M—PR-10, 220 MHz—PR-20, 440 MHz—PR-40.

| | |
|---|---|
| Each kit | $17.95 |

### TONE DECODER

A complete tone decoder on a single PC board. Features: 400–5000 Hz adjustable range via 20-turn pot, voltage regulation, 567 IC. Useful for touch-tone burst detection, FSK, etc. Can also be used as a stable tone encoder. Runs on 5 to 12 volts.

| | |
|---|---|
| Complete kit, TD-1 | $5.95 |

### VOICE ACTIVATED SWITCH

Voice activated switch kit provides switched output with current capability up to 100 mA. Can drive relays, lights, LED, or even a tape recorder motor. Runs on 9 VDC.

| | |
|---|---|
| VS-1 kit. | $6.95 |

### TELEPHONE TRANSMITTER

Mini-sized with professional performance. Self-powered from phone line, transmits in FM broadcast band up to ¼ mile. Installs easily anywhere on phone line or inside phone!

| | |
|---|---|
| PB-1 kit | $14.95 |

## NEW

### SPEAKER PHONE

Talk on the phone hands-free, great to put in shop or shack, press the button to answer—no actual phone needed. Works same as commercial units. Talk from anywhere in room, phone line powered—no battery needed. Super for family and conference calls or buy two for hands-free intercom! Add our case set for a pro look.

| | |
|---|---|
| SP-1 | $29.95 |
| Case-CSP | $12.95 |

### TICKLE STIK

A shocking kit! Blinking LED attracts victims to pick up innocent-looking can—you watch the fun! Ideal for office desks, parties, nosey know-it-alls!

| | |
|---|---|
| TS-4 kit | $9.95 |

### LIGHT BEAM COMMUNICATORS

Transmits audio over infrared beam up to 30′—use simple lenses to go up to ¼ mile! Hum free, uses 30 kHz carrier. Great for wireless earphones or undetectable "bug."

| | |
|---|---|
| Transmitter + receiver set, LB56 | $19.95 |

### FM RADIO

Full-fledged superhet, microvolt sensitivity, IC detector and 10.7 MHz IF. Tunes Std. FM broadcast band as well as large portions on each end. Ideal for "bug" receiver, hobby experiments or even as FM radio!

| | |
|---|---|
| FR-1 kit | $14.95 |

### SUPER SLEUTH

A super sensitive amplifier which will pick up a pin drop at 15 feet! Great for monitoring baby's room or as general purpose amplifier. Full 2W rms output. Runs on 6 to 15 volts, uses 8–45 ohm speaker.

| | |
|---|---|
| BN-9 kit | $5.95 |

### BROADBAND PREAMP

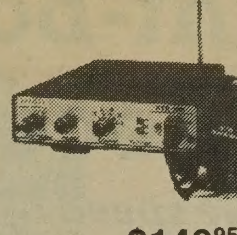
Very popular sensitive all-purpose preamp, ideal for scanner, TVs, VHF/UHF rigs, counters. Lo noise, 20 dB gain, 100 kHz–1 GHz, 9V–12 VDC operation.

| | |
|---|---|
| SA-7 kit | $14.95 |

## •2 METERS •223 MHz •440 MHz

## FANTASTIC FM TRANSCEIVERS

### SYNTHESIZED—NO CRYSTALS



$14995

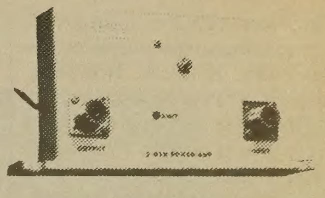
Ramsey breaks the price barrier on FM rigs! The FX is ideal for shack, portable or mobile. The The wide frequency coverage and programmable repeater splits makes the FX the perfect rig for Amateur, CAP or MARS applications. Packet ORs really appreciate the dedicated packet port, "TRUE-FM" signal and almost instant T/R switching. High speed packet? .... No problem. Twelve diode programmed channels, 5W RF output, sensitive dual conversion receiver and proven EASY assembly. Why pay more for a used foreign rig when you can have one AMERICAN MADE (by you) for less. Comes complete less case and speaker mike. Order our matching case and knob set for that pro look.

| | |
|---|---|
| FX-146 kit (2 Meters) | $149.95 |
| FX-223 kit (1¼ Meters) | $149.95 |
| FX-446 kit (3/4 Meters) | $149.95 |
| CFX matching case set | $ 24.95 |

### 2 MTR & 220 BOOSTER AMP

Here's a great booster for any 2 meter or 220 MHz hand-held unit. These power boosters deliver over 30 watts of output, allowing you to hit the repeater's full quieting while the low noise preamp remarkably improves reception. Ramsey Electronics has sold thousands of 2 meter amp kits, but now we offer completely wired and tested 2 meter, as well as 220 MHz, units. Both have all the features of the high-priced boosters at a fraction of the cost.

| | |
|---|---|
| PA-10 2 MTR POWER BOOSTER (10 X power gain)<br>Fully wired & tested | $79.95 |
| PA-20 220 MHz POWER BOOSTER (8 X power gain)<br>Fully wired & tested | $79.95 |



## QRP TRANSMITTERS HAM RECEIVERS

### 20, 30, 40, 80M CW TRANSMITTERS

Join the fun on QRP! Thousands of these mini-rigs have been sold and tons of DX contacts have been made. Imagine working Eastern Europe with a $30 transmitter—that's ham radio at its best! These CW rigs are ideal mates to the receivers at right. They have two-position variable crystal control (one popular QRP XTAL included), one watt output and built-in antenna switch. Runs on 12VDC. Add our matching case and knob set for a handsome finished look.

| | |
|---|---|
| Your choice of bands<br>(Specify band: QRP-20, 30, 40 or 80) | $29.95 |
| Matching case & knob set, CQRP | $12.95 |

### 20, 30, 40, 80M All Mode RECEIVERS

Build your own mini ham station. Sensitive all-mode AM, CW, SSB receivers use direct conversion design with NE602 IC as featured in *QST* and ARRL handbooks. Very sensitive varactor tuned over entire band. Plenty of speaker volume. Runs on 9V battery. Very EASY to build, lots of fun and educational—ideal for beginner or old pro. New 30-page manual. Add the case set for well-fitted professional look.

| | |
|---|---|
| Your choice of bands<br>(Specify band: HR-20, HR-30, HR-40, HR-80) | $27.95 |
| Matching case & knob set, CHR | $12.95 |

## E-Z KEY CMOS KEYER

Send perfect CW within an hour of receiving this kit! Easy-to-build kit has sidetone oscillator, speed control and keys most any transmitter. Runs for months on a 9V battery. 28-page manual gives ideas on making your own key for extra savings. Add our matching case set for complete station look.

| | |
|---|---|
| CW-7 kit | $24.95 |
| Matching case knob set, CCW | $12.95 |

## ACTIVE ANTENNA

Cramped for space? Get longwire performance with this desktop antenna. Properly designed unit has dual HF and VHF circuitry and built-in whip antenna, as well as external jack. RF gain control and 9V operation makes unit ideal for SWLs, traveling hams or scanner buffs who need hotter reception. The matching case and knob set gives the unit a hundred dollar look!

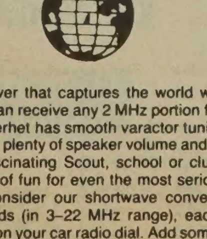
| | |
|---|---|
| AA-7 Kit | $24.95 |
| Matching case & knob set, CAA | $12.95 |

## SPEECH SCRAMBLER

Communicate in total privacy over phone or radio. Kit features full duplex operation using frequency inversion. Both mike and speaker or line in/out connections. Easy hookup to any radio, and telephone use requires no direct connection! Easy to build 2 IC circuit. Can also be used to descramble many 2-way radio signals. Finish your kit off with the handsome case & knob set.

| | |
|---|---|
| SS-7 kit | $29.95 |
| Matching case & knob set, CSS | $12.95 |

## SHORTWAVE RECEIVER



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| | |
|---|---|
| Shortwave receiver kit, SRI | $27.95 |
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| | |
|---|---|
| FM communications receiver kit<br>Specify band: FR 146 (2m), FR6 (6m), FR10 (10m), FR-220 (220 MHz) | $29.95 |
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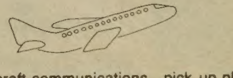

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|---|---|
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# A Simple Light-Based Transmitter/Receiver Pair

## *Voice communications at the speed of light.*

by Joseph Consugar KC3XM

When you mention light-based communications, most people immediately think of lasers. However, there is no reason any other light source cannot be used as well. There are examples of people using light-emitting diodes (LEDs), incandescent light bulbs, and even Alexander Graham Bell's experiments using sunlight.

For the past few months I've been experimenting using infrared LEDs in a voice transmitter. In the process, I've tried a number of different circuits, but the transmitter and receiver described below have been the best of the lot.

They are easy to put together, and while they may appear simple, they can give surprising performance.

### Transmitter Circuit Description

The transmitter shown in Figure 1 consists of a 741 op amp and an LM386 audio amplifier. The 741 serves as a microphone preamplifier, the gain of which is set by R1. The output of the 741 is capacitively coupled to a 386 configured to provide an additional gain of 200. The signal from the 386 is used to amplitude-modulate an infrared LED. Resistor R2 serves to limit the current going through the LED.

You can use any sound source that doesn't overdrive the amplifier. I've used crystal and dynamic microphones. For testing, the output from a radio earphone jack will do nicely.

### Receiver Circuit Description

The receiver circuit shown in Figure 2 is practically identical to the transmitter, but instead of taking an audio signal and converting it to light, it takes a light signal and converts it to audio.

Photo-transistor Q1 serves as the light detector and produces a current proportional to the light incident upon it. This current is fed to a 741 op amp configured as a current-to-voltage converter, the sensitivity of which is set by R6.

The output of the 741 is coupled to a 386 audio amplifier. Variable resistor R7 serves as a volume control. The output of the audio amplifier is fed to a phono jack to which you can attach a small speaker, or headphones for portable operation.

### Construction and Testing

Since you will need it to test the transmitter, I suggest you build the receiver first. When building the prototype, I used sockets for the ICs. Also, instead of attaching the phototransistor directly to the circuit board, I took a tip from an article by Forest Mims and brought the connections out to a phono jack. The phototransistor was soldered onto a phono plug and the plug inserted into the jack. This type of mounting has two advantages. Should you wish to experiment with different types of light detectors, it allows you to change them quickly. In addition, audio cable can be used to mount the detector a distance away from the amplifier circuitry.

After wiring the circuit, insert the ICs and phototransistor into their proper receptacles. Plug a set of headphones into the receiver audio jack, then set the volume control at about half maximum and the sensitivity at minimum. Point the phototransistor at a lit incandescent or fluorescent lamp and slowly increase the sensitivity. At a certain point you will hear a humming noise in the headphones. If you don't hear the humming even after increasing the sensitivity all the way, go back and check your wiring. One thing to be particularly careful of is to make sure the phototransistor is wired into the circuit correctly (emitter-to-ground).

As the receiver sensitivity is increased, you may reach a threshold where the humming distorts and then stops. This is the point where the receiver's current-to-voltage converter has saturated. Greatest sensitivity is obtained by operating the receiver just below this threshold.

Once you have the receiver working you can start on the transmitter. All the comments made about the receiver construction hold for the transmitter, including the advantages of bringing the LED connections out to a phono jack and soldering the LED onto a phono plug.

To test the circuit, feed some sort of audio signal into the transmitter audio input. This can be the signal

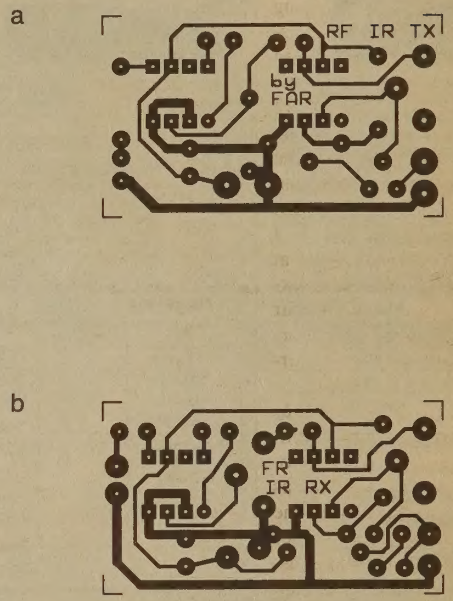

Figure 2 (a). PC board foil pattern for the transmitter. (b). The PC board for the receiver.

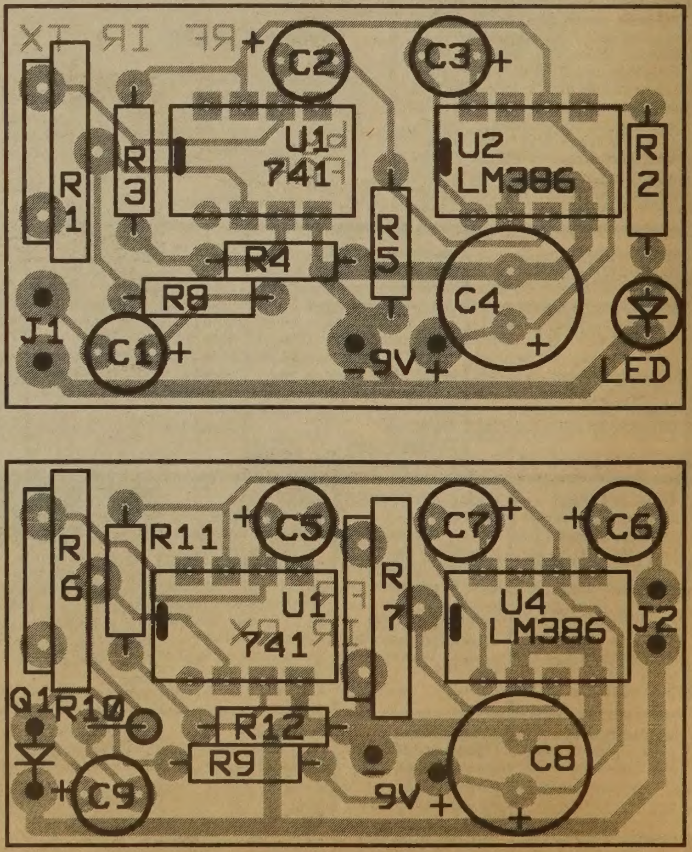

Figure 3 (a). Parts placement for the transmitter. (b). Parts placement for the receiver.

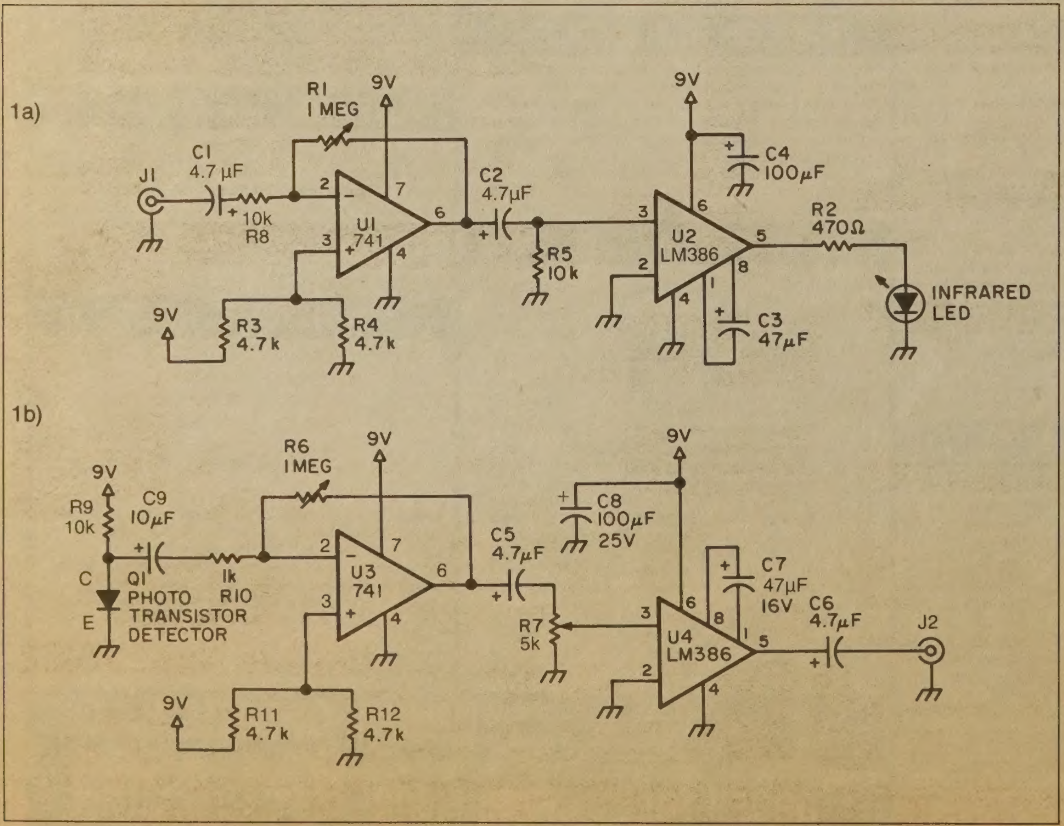

Figure 1 (a). Schematic diagram of the transmitter. (b). Receiver diagram.

from the phono jack of a small radio or even the output of an audio oscillator. Wave the receiver phototransistor in front of the transmitter LED and you should hear the signal changing in volume as you alternately approach and move away from the transmitter LED.

### Final Notes

I used one of those plastic videotape storage cases as an enclosure for this project. The plastic is easy to work with and there is plenty of room inside for a moderate-sized circuit board and batteries.

If you look at the output of the transmitter or receiver on an oscilloscope, you may notice a high frequency oscillation. Since the frequency of this oscillation is above the audible range, it will not affect the operation of the transmitter or receiver.

I have been able to communicate over a range of at least 10 feet using only the bare LED and phototransistor by installing a high output LED in the transmitter. You can increase this range by decreasing the value of R2 in the transmitter (thereby increasing the amount of light coming from the LED), or by using lenses at the transmitter or receiver to focus the light. If you decide to use the lenses, I recommend that you install them at the receiver first. It has been my experience that the sensitivity of your receiver will be the limiting factor. You will be surprised at the difference even a small lens will make.

Finally, you should try to limit as much as possible the amount of ambient light striking the receiver phototransistor. This can be as simple as placing a cardboard tube over the phototransistor. Surprisingly, under low light conditions the phototransistor is more sensitive if there is a small amount of light striking it since the light serves to bias it into a more sensitive region of its operating curve. RF

*Contact Joseph Consugar KC3XM at 1601 Woodtree Ct. W, Annapolis MD 21401.*

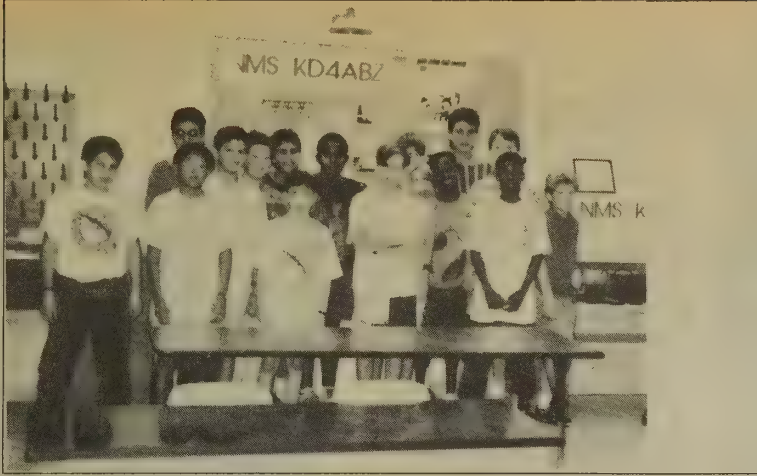

**Photo C. The Nova Middle School Titans amateur radio classes are composed of 48 7th and 8th graders. Amateur radio classes are classified as a special interest elective. The students in this photo are studying for their Novice licenses under the direction of Patricia Lovarco KD4ABZ. Next year they'll have the opportunity to continue classes and upgrade to Technician and General. Nova's principal, Mr. Steven Friedman, purchased the ICOM-735, the Astron power supply, and the Cushcraft R-5 antenna. The classes use an Apple IIe for Morse code practice and handmade oscillators. The students also made Morse code initial bracelets.**

### Parts List.

| | |
|---|---|
| **Transmitter** | |
| R1 | 1 MEG variable resistor, linear taper, Radio Shack #271-211 |
| R2 | 470 ohm, Radio Shack #271-1317 |
| R3,R4 | 4.7k, Radio Shack #271-1330 |
| R5,R8,R9 | 10k, Radio Shack #271-1335 |
| C1,C2,C5,C6 | 4.7 µF electrolytic, Radio Shack #272-1024 |
| C3,C7 | 47 µF electrolytic, Radio Shack #272-1027 |
| C4 | 100 µF electrolytic, Radio Shack #272-1028 |
| C9 | 10µF electrolytic, Radio Shack #272-1025 |
| U1 | 741 op-amp, Radio Shack #276-007 |
| U2 | LM386, RS# 276-1731 |
| LED | Infrared light emitting diode, RS# 276-143 or 276-142 |
| J1 | Phono jack |
| B1 | 9-volt battery |
| **Receiver** | |
| Q1 | Phototransistor detector, RS# 276-145 or 276-142 |
| R6 | 1 MEG variable resistor, linear taper, RS# 271-211 |
| R7 | 5k variable resistor, linear taper, RS#271-1714 |
| R9 | 10k resistor |
| R10 | 1k resistor |
| R11,R12 | 4.7k resistor |
| C5,C6 | 4.7 µF electrolytic, RS# 272-1024 |
| C7 | 47 µF electrolytic, RS#272-1027 |
| C8 | 100 µF electrolytic, Radio Shack #272-1028 |
| C9 | 10µF electrolytic, Radio Shack # 272-1025 |
| U3 | 741 op-amp, RS# 276-007 |
| U4 | LM386, RS# 276-1731 |
| J2 | Phono jack |
| B1 | 9-volt battery |

All resistors are 1/4 watt, all capacitors should have a voltage rating higher than 12 volts.

Note: Blank PC boards are available for the transmitter and receiver for $3 each + $1.50 per order from FAR Circuits, 18N640 Field Court, Dundee IL 60118.

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| BP-7 | 13.2v | 500mah | $23.00 |
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| BP-22 | 8.4v | 270mah | $22.00 |

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| Ten-Tec BP1 | 500mah | $19.95 |
| San-Tec #142#144 Tabs | 600mah | $22.00 |
| Azden 300 Tabs | 600mah | $15.00 |
| Bearcat | 600mah | $20.00 |
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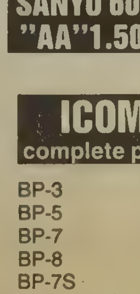

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| BP85-S | 12.0v | 800mah | $60.00 |

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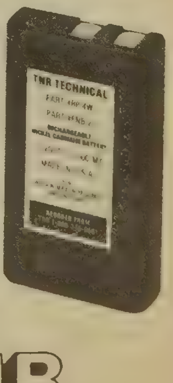
| FNB-11 | 12.0v | 600mah | $52.00 |
| FNB-12 | 12.0v | 500mah | $45.00 |
| FNB-12S | 12.0v | 600mah | $48.00 |
| FNB-14 | 7.2v | 1000mah | $48.00 |
| FNB-14S | 7.2v | 1400mah | $59.00 |
| FNB-17 | 7.2v | 600mah | $35.00 |

*FNB-2 10.8v 500mah $19.00



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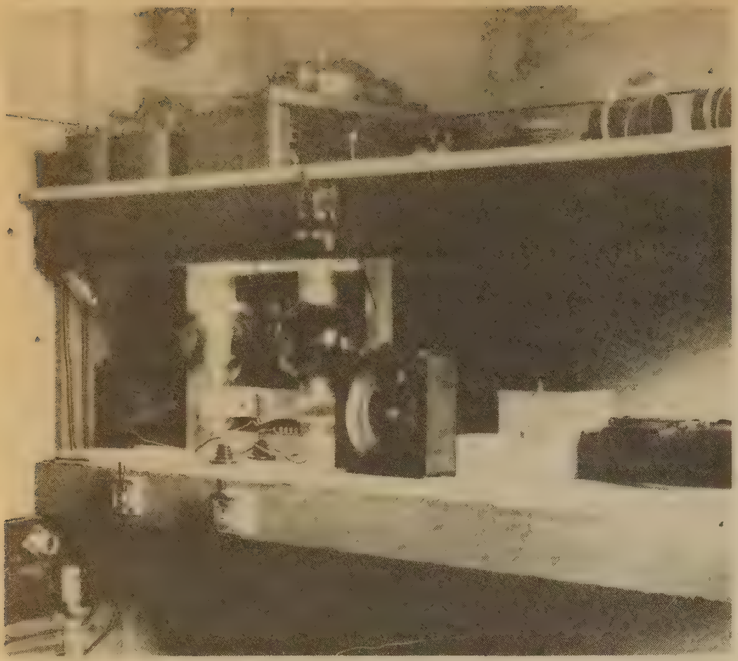

Photo C. A view of the transmitter table.

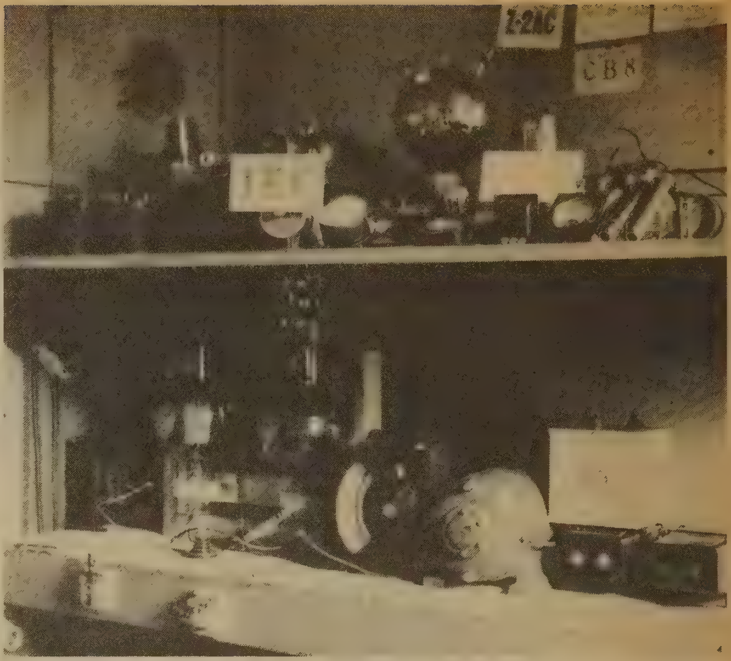

Photo D. A view of the transmitter table with our most precious items of equipment on display.

It never did electrocute us, but adjusting the device for minimum sparking with 5,000 volts across it was certainly dangerous.

## The Transmitting Tube

A major factor in working our long distance circuits of the 1924 era was the transmitting tube. Joe and I had put our money on a Western Electric 250-watt tube and expected great results with it. However, it was made for use at the relatively low frequencies of the broadcast band above 200 meters. We were pushing up into shorter and shorter wavelengths. Before long we had flashes inside the tube, across some fiber insulator strips which maintained the filament grid and plate in alignment. Once that happened there wasn't much we could do with our big tube. The Western Electric 250-watt tube had an oxide-coated filament which was fine for producing a lot of electrons, but probably hindered evacuation of the tube and made it unsuitable for really high voltage operation.

Fortunately, we had a friend in Northampton, Charlie Derose 1CND, who had an RCA 204 tube, with a solid tungsten filament and no thorium, which was very well evacuated. It took the 5,000 volts from the sync rectifier at about 350 milliamps without a whimper, and supplied many watts to the 150-foot-tall antenna.

On October 18, 1924, Joe and a couple of his friends stayed up all night working DX. At 6 o'clock in the morning I woke up and went out to the radio shack, where I was told that a station in New Zealand had been heard. Then Joe and his team collapsed and went to bed. Propagation conditions must have turned very favorable because in a few minutes I had raised Z-2AC and had a fairly good circuit with Ivan H. O'Meara, who operated Z-2AC. I also talked with another New Zealand station that morning. I believe it was Z4AA, as indicated by the card from Australian A3XW.

That experience in 1924 was the high point in the operation of U1KC on a high antenna and with high power and the melodious tone of a sync rectifier. It was amateur communication between the antipodes, and represented a circuit of almost 12,000 miles. The wavelength actually used appears to have been between 80 and 90 meters, which was a very short wavelength in 1924, but nowhere near short enough to have been optimal for the circuit worked.

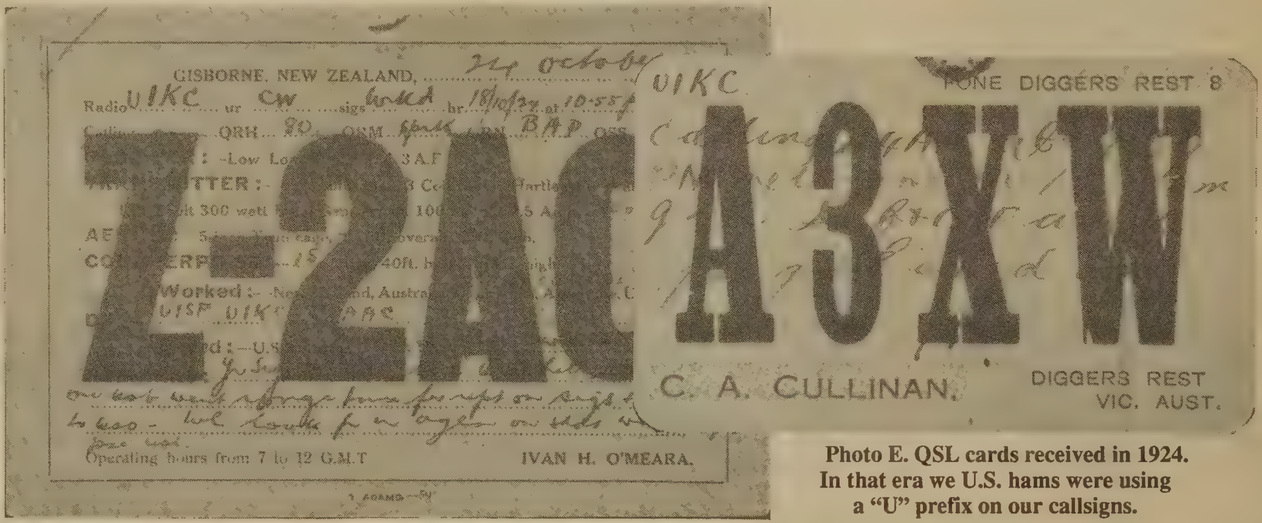

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Photo E. QSL cards received in 1924. In that era we U.S. hams were using a "U" prefix on our callsigns.

On April 5, 1991, I worked VK3MEY of Melbourne, Australia, with only 100 watts, on 10 meters, with a dipole antenna only 24 feet above the ground. This was on single sideband phone. In both 1924 and 1991 my signals could be described as weak. The 10 meter frequency of 1991 was far more efficient than the 90 meter signal of 1924. The difference in time was about 67 years, but the engineering requirements for such antipodal communication don't seem to have changed much. We seem to have had those requirements pretty well figured out in 1924. **RF**

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by Carole Perry WB2MGP

## Where In The World Are We?

Teaching amateur radio to 6th, 7th, and 8th graders opens the door to providing many exciting lessons in all areas of the school's curricula. One of the most dynamic subject areas that is a natural outcome of making contacts on the radio is geography. Gone are the days where a teacher can say, "Open your books to page 42 so we can learn about the country of Iran." Children today require more hands-on learning and more direct personal involvement in the learning process. Teachers should be creative and should present material in an exciting and challenging way.

In an effort to keep the fun and excitement of a radio contact in the follow-up geography lessons, I've developed some activities that the children enjoy doing and learn a great deal from. At the end of our "CQ All Schools Net" every Tuesday and Thursday at 17:30 UTC on 28.303 MHz, we create a box for every state and country we've made a contact with. The outside of the box has a map outline of the country or state properly labeled on the front.

The youngsters can choose one of the boxes to work on. They write letters to the Chambers of Commerce and to the Departments of Tourism of the major cities of that location and begin to gather data. They write reports on the industry and agriculture of the area. Some of the children draw posters of the state bird and flower. Others do reports on famous people associated with that location. The person we've spoken to on the air becomes a resource for the children to interview for further information.

Geography teacher Susan Besemer of Buffalo, New York, has a great activity using a grapefruit. The grapefruit can be a model for the earth in a demonstration of how a three-dimensional globe can be represented on a two-dimensional map. On a large grapefruit, mark a blue "N" for north at one end and a red "S" for south at the other. With a sharp knife, cut an "X" across the "N." Then slightly rotate the grapefruit and cut another "X" across the "S." Make the cuts about one half inch deep but don't extend them too far—they should be at least an inch short of the "equator." As you cut, explain some of the basic features of maps and globes—the poles, the equator, and the lines of longitude and latitude.

Next, cut straight down along one "longitudinal line" from the top to the bottom of the grapefruit, or from the North Pole to the South Pole, avoiding any intersection with the "X" cuts. Remove the peel all in one piece by first loosening it carefully around the poles and then working the rest off, starting from the one longitudinal cut. Flatten the peel and let the class take a look. The bits of blue marker at the "north" end and red marker at the "south" end will help students locate the poles in this new representation. If you have older children in your class, you can provide a supervised area where they can create their own grapefruit "globes."

Around Halloween time, I have the youngsters bring in pumpkins and water-soluble markers. Each group of youngsters is given a globe to use as a model. It's advisable to initiate this project quickly because the pumpkins do have a tendency to spoil rapidly in a warm classroom. The pumpkin globes must include the following: North and South Poles; Equator; Prime Meridian; the seven continents of North America, South America, Europe, Asia, Africa, Australia, and Antarctica; and the four major oceans—Atlantic, Pacific, Indian, and Arctic. I have the youngsters label all of these features on the pumpkin globe. They also have to locate and label where we are. Some of the children prefer to cut the continents out of paper and then glue them to the pumpkin. Either way, it's a real fun project to use to reinforce geography skills.

After a month's worth of reports and activities have been presented to the class, all the children prepare riddles or questions about the location they were involved with as a result of radio contacts. Many of my youngsters are pen pals with other school children across the country. They have the ability to get tremendous amounts of firsthand information from their pen pals. It's great fun to speak with someone on the radio and then be able to correspond with them. The students try their riddles and questions out on hams they speak with on the air. Then we quiz each other and a wonderful social studies and geography lesson ensues.

So, if you are a teacher lucky enough to be using amateur radio in the classroom, take advantage of the many creative and exciting activities that can be used to make the learning experience fun for all. RF

**Photo A. Dara points to the location of a radio contact the class has made.**

**Photo B. Steven lines up the pumpkin globes done by his group.**

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# Simplified 146/446 Antenna Projects

## *Inexpensive and easy.*

by Milton Scott N5SQI

Recently, I built the VHF/UHF antenna and magnetic mount described by AD5X (*73 Amateur Radio Today*, January 1991, p.55) and I ran across some very simple ways to save money and time on the antenna. Additionally, I have come up with a simple dual-band antenna using a standard CB magnetic mount. I would like to share these ideas with my fellow hams.

### Magmount BNC Antenna

The first antenna to be built is for any magnetic base mount that uses a BNC connection, such as the one described in the AD5X article. My simplified version of the dual-band antenna for the 2m and 70cm bands is built on the same male BNC to female Motorola adapter from Radio Shack (RS 278-117) described in the AD5X article. However, it is better to use a 1/8″ brass rod, which can be purchased from most hardware stores. This saves the price of the Motorola plug (RS 274-711) originally called for in the article.

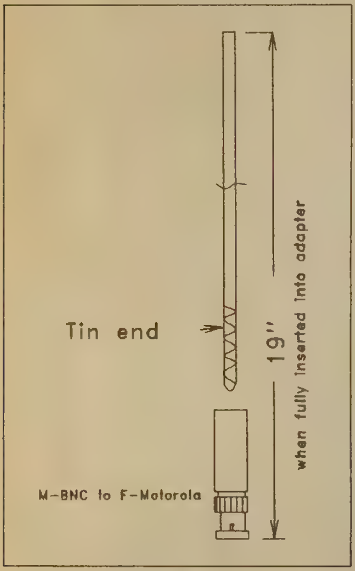

Figure 1.

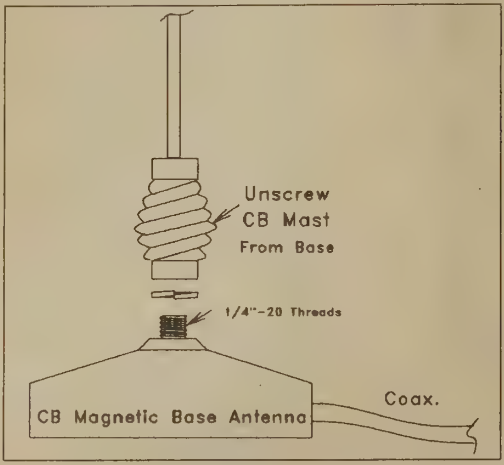

Figure 2.

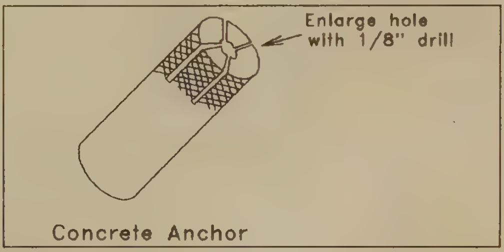

Figure 3.

To build this antenna, first round one end of the rod with a sander or file as shown in Figure 1. Lightly tin this rounded end with solder and firmly insert the tinned end into the female Motorola end of the adapter. The solder increases the diameter of the rod, and ensures a tight fit in the Motorola connector.

Next, fill the opening around the rod with hot glue. If the connector is heated slightly first, applying the glue will be much simpler because the glue will flow farther into the connector before hardening.

The rod can now be cut to an overall length of 19″ (see Figure 1), measured from the male BNC end of the connector to the end of the rod. This length will give you an SWR reading as shown:

| FREQ (MHz) | 144 | 146 | 148 | 440 | 445 | 450 |
|---|---|---|---|---|---|---|
| SWR | 1.1 | 1.4 | 1.6 | 1.8 | 1.9 | 1.8 |

A piece of heat-shrink tubing should be placed over the adapter to help keep moisture out of the connector.

### CB Magmount 146/446 MHz Antenna

The second antenna project is a modification of a CB center-loaded magnetic base antenna. These antennas can be purchased at many discount stores for around $10–$12. First, however, check the antenna to be sure the antenna mast can be unscrewed from the magnetic base unit (see Figure 2). Also, check the size of the threaded end protruding from the antenna base. It should have 1/4″-20 threads.

After removing the mast, I modified the antenna base by replacing the cheap coax with a piece of lower loss RG8M, which can be purchased from your local Radio Shack. This coax has a large multi-strand center conductor which must be modified by removing several outer strands so that it will fit into the center pin of a connector designed for RG59 coax. Using a PL259 connector will work just fine, if that is what your radio needs.

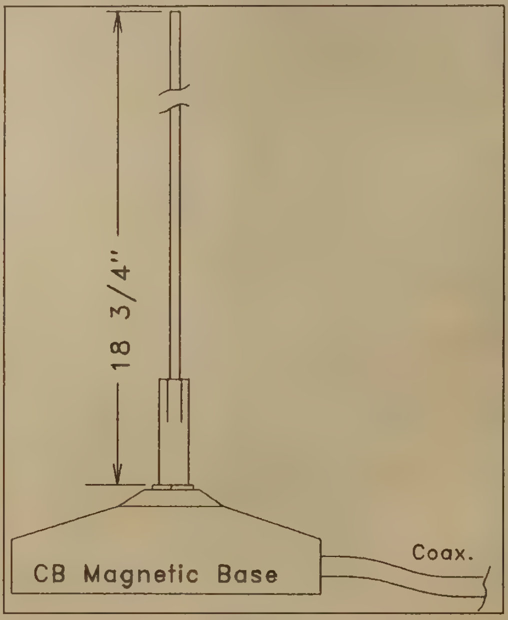

Figure 4.

The dual-band 2m and 70cm antenna for this magmount base is made by purchasing a concrete anchor with a 1/4″-20 female threaded end (see Figure 3), and a piece of 1/8″ brass rod from your local hardware store. The concrete anchor has a steel insert which is used to spread the anchor. This must be removed by inserting a small nail into the split end and tapping until the insert pops out.

To modify the anchor, hold it in a vise by the end without the splits and enlarge the hole in the split end with a 1/8″ drill. Use a sander or file to round the rod on one end, then insert the rounded end into the split end of the anchor. Finally, screw the anchor on the male threaded end of the magnetic base and press the rounded end of the rod all the way into the anchor. Measure 18-3/4″ from the end of the housing and cut the rod off at this point (Figure 4). The SWR should be as shown in the following chart:

| FREQ (MHz) | 144 | 146 | 148 | 440 | 445 | 450 |
|---|---|---|---|---|---|---|
| SWR | 1.5 | 1.3 | 1.2 | 1.7 | 1.6 | 1.5 |

The rod should be soldered to the concrete anchor to prevent further movement.

Try this simplified approach to building a combination quarter-wave 2 meter and three-quarter-wave 446 MHz antenna, and the simple dual-band antenna using a CB magnetic base mount. These antennas can be constructed very inexpensively, letting you have fun at the same time! **RF**

*Contact Milton Scott N5SQI at P.O. Box 266, Princeton TX 75077-0266.*

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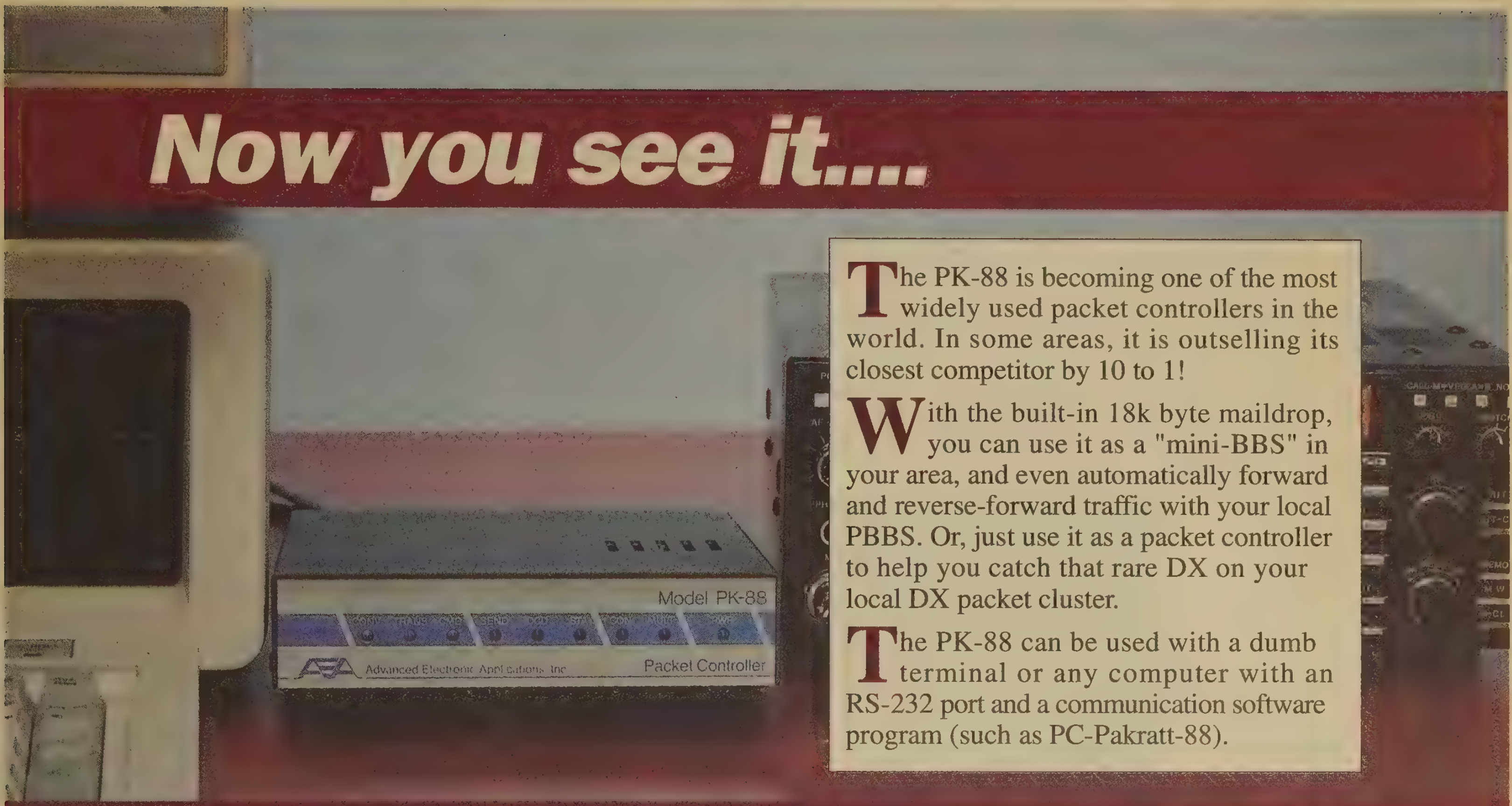
## DOVE Status Report

**Continued from page 1**

sending their hardware donations to AMSAT-UK instead of AMSAT-NA, where they are more confident they'll get results, or at least an explanation from the University of Surrey (UoSAT) team and/or read of it in *OSCAR News* (UK) when something doesn't go according to schedule. According to these folks, AMSAT-NA has dropped the ball, and hasn't bothered to keep members informed.

Some *OSCAR Satellite Report* readers in the U.S. said they were going to ignore the recent appeal from AMSAT-NA for donations toward the Phase 3D Project, waiting until they had more confidence that the funds would be effectively expended. *OSCAR Satellite Report* responded by encouraging readers to support AMSAT-NA in the Phase 3D Project. It is truly a major project requiring international cooperation, not competition. The international amateur satellite community needs to unite behind the Phase 3D Project. K8OCL, in his editorial, writes, "We're perfectly confident that Dr. DeCastro, now a recently elected member of the AMSAT-NA Board of Directors, will bring a happy and prompt resolution to this situation, and that DOVE will be singing soon." *TNX K8OCL, OSCAR Satellite Report Number 236.*

# Now you see it....



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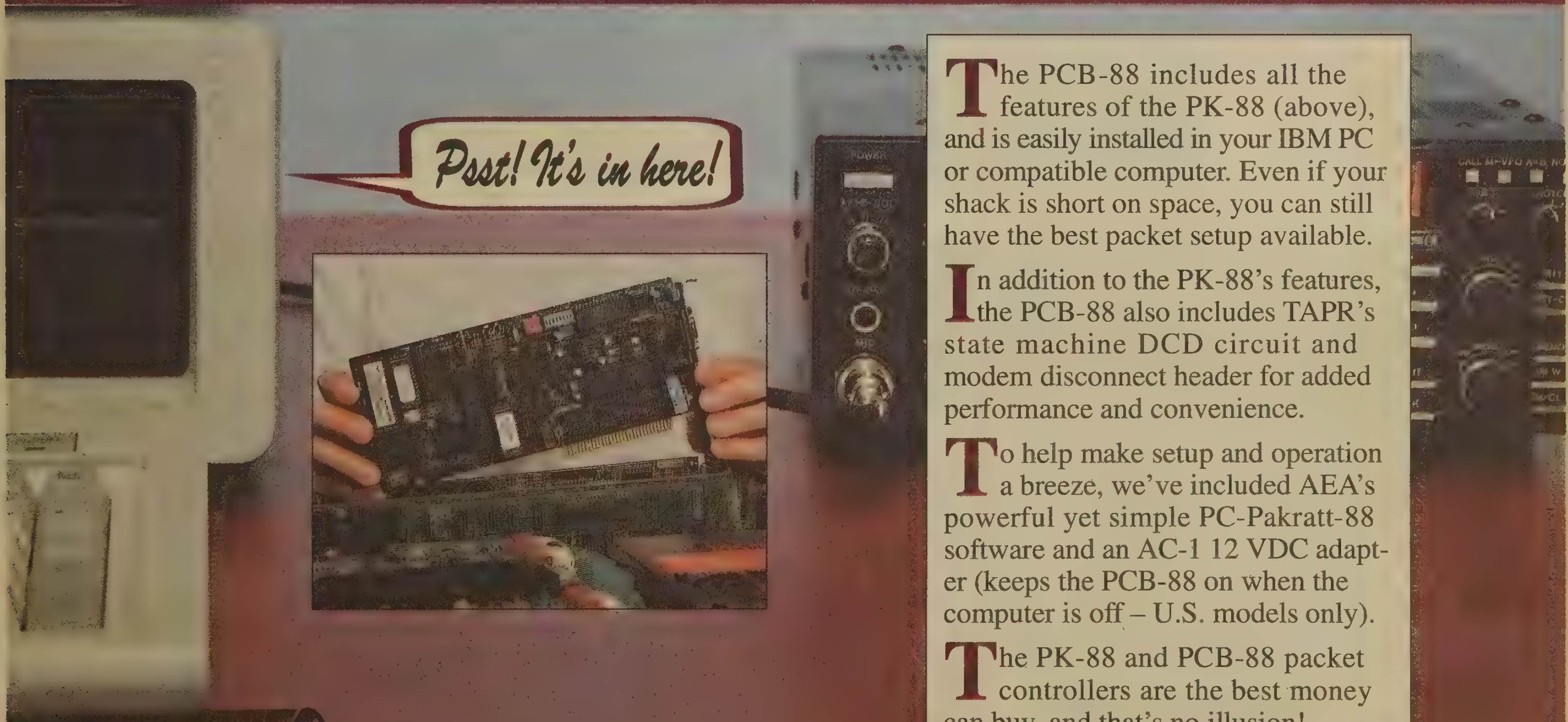
The PK-88 can be used with a dumb terminal or any computer with an RS-232 port and a communication software program (such as PC-Pakratt-88).

# Now you don't.



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In addition to the PK-88's features, the PCB-88 also includes TAPR's state machine DCD circuit and modem disconnect header for added performance and convenience.

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# try something new

by Bill Brown WB8ELK

## Auroras

For anyone living in the northern latitudes, there's nothing quite so fascinating and exciting as a good display of the ''Northern Lights'' (aurora borealis). If you're in a dark area away from the city lights, you'll probably be presented with a light show that will rival anything you'll see at a planetarium or concert! I've seen displays that range from a dull green glow in the north to blazing red, orange and green bolts of light screaming across the sky at warp speed (you won't see effects like this in a Star Trek movie). Photos A–D were taken from my back yard during a fantastic display on October 28, 1991. A display just a week later covered the whole sky here in New Hampshire (imagine looking *south* to see the northern lights) and was even seen as far south as Tucson, Arizona!

### Buzz Mode

During an aurora display, I usually take some time out from the show and head for the hamshack. An auroral display is created when charged particles from a solar flare or storm ionize the upper reaches of the atmosphere (the particles are usually trapped by the earth's magnetic poles). Not only does this produce spectacular visual effects, but it allows you to bounce your radio signals off of it at frequencies as high as 432 MHz. I just tune into 2m SSB (most of the activity is around 144.200 MHz), point my beam towards the north and join in the fun. Activity may occur on 6m and occasionally as high as 432 MHz.

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Aurora contacts are very distinctive and a lot of fun. Contacts over 1,000 miles on 2 meters are possible during a good aurora display. As the auroral front moves further south, you'll start hearing stations more and more to your south. During the display shown in photos A–D, I started to hear stations in Quebec, most of New England, Pennsylvania, New York and as far south as Maryland. Then the display intensified and I started to hear stations in Ohio and Indiana (800 miles or more from this location). During the incredible display the night of November 8th, stations as far south as Arizona and Texas were able to make auroral contacts!

### What Equipment Do You Need?

You can join in the fun with a modest station. The minimal requirements are a beam that you can point north, a multimode rig, transverter or downconverter that will allow you to tune in SSB or CW on 2 meters. Although higher power will help, you can make aurora contacts with as little as 10 watts.

### When Do They Occur?

Auroral openings are fairly rare, depending on your location. For those of you in Alaska, the northern territories of Canada and the North Pole, you'll see displays regularly. The northeastern part of the U.S. has the best opportunity for a number of good openings during the year. As you go farther to the southwest, your chances dimimish. The Midwest will experience a number of openings (but fairly rarely). Those of you in the Southwest or Southeast will only see an opening on the rarest of occasions (if at all).

How do I know when an aurora is in progress? Most auroral openings start in the late afternoon or early evening and can continue to the wee hours of the morning. Listen to the low band HF frequencies (40 or 80 meters). If you hear stations that sound as if they were in the bottom of a barrel with a very watery, wavy effect, you might have an aurora opening in progress. Listen to the WWV (or WWVH) time station on 2.5, 5, 10, 15 or 20 MHz at 18 minutes past each hour. They give the current solar activity, any geomagnetic storm warnings and a ''K'' and an ''A'' index. Anything over a ''K'' value of 4 and an ''A'' value of 30 has a likely prospect for a geomagnetic storm, and good potential for an auroral opening.

For those of you who check into the DX packet-cluster network, make sure you let the folks there know if you see (or hear) an aurora. Call up a few of your ham radio friends in nearby states on the phone and give it a try; you might be surprised at the results. And, of course, if you see a good display, run to the hamshack, tune into 144.200 MHz and have a blast! RF

**Photo B. Looking northeast at the aurora borealis (note the big dipper to the left).**

**Photo A. The northern lights display as seen from Hancock, New Hampshire the night of October 28th. This display allowed VHF contacts from this location to as far away as Virginia and Indiana.**

**Photo C. Intense red and green spotlights form during the aurora's peak at 2 a.m.**

**Photo D. A curtain of ionization just waiting to provide you with VHF radio contacts.**

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How do I know when an aurora is in progress? Most auroral openings start in the late afternoon or early evening and can continue to the wee hours of the morning. Listen to the low band HF frequencies (40 or 80 meters). If you hear stations that sound as if they were in the bottom of a barrel with a very watery, wavy effect, you might have an aurora opening in progress. Listen to the WWV (or WWVH) time station on 2.5, 5, 10, 15 or 20 MHz at 18 minutes past each hour. They give the current solar activity, any geomagnetic storm warnings and a "K" and an "A" index. Anything over a "K" value of 4 and an "A" value of 30 has a likely prospect for a geomagnetic storm, and good potential for an auroral opening.

For those of you who check into the DX packet-cluster network, make sure you let the folks there know if you see (or hear) an aurora. Call up a few of your ham radio friends in nearby states on the phone and give it a try; you might be surprised at the results. And, of course, if you see a good display, run to the hamshack, tune into 144.200 MHz and have a blast! RF

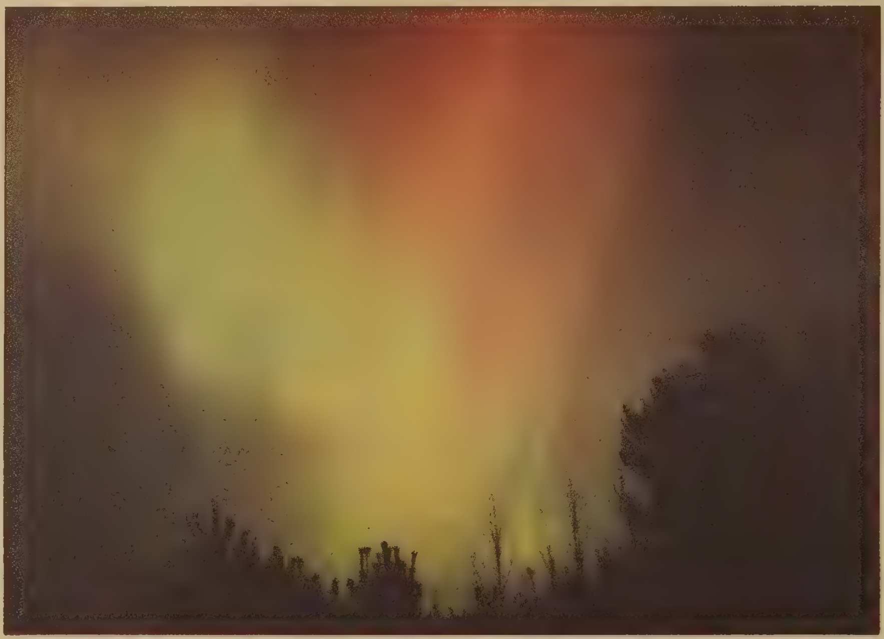

**Photo B. Looking northeast at the aurora borealis (note the big dipper to the left).**

**Photo A. The northern lights display as seen from Hancock, New Hampshire the night of October 28th. This display allowed VHF contacts from this location to as far away as Virginia and Indiana.**

**Photo C. Intense red and green spotlights form during the aurora's peak at 2 a.m.**

**Photo D. A curtain of ionization just waiting to provide you with VHF radio contacts.**

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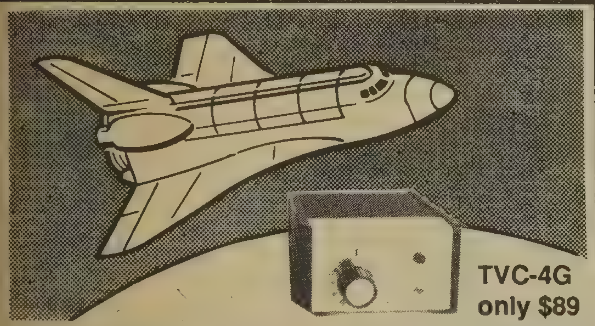

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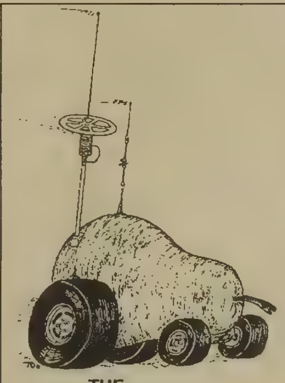

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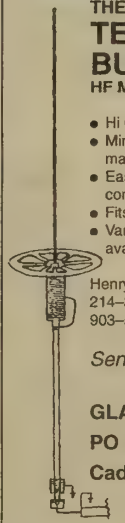

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# Make Your Own Custom QSLs

## *Use your 35mm camera to make your own inexpensive, high-quality custom QSL cards.*

by Ken Gledhill N7TXG

As most good home-brewers know, ingenuity can frequently replace cash for providing some of the items that we need in ham radio. When I first received my amateur radio ticket, I faced the problem of getting some QSL cards to send confirming my new contacts on the air. I started by checking the cost of commercially printed cards. I found that the best price on professionally printed QSL cards comes when you order them in quantities of a thousand or more. In small quantities (if there is such a thing), standard QSL cards cost approximately 25 cents each. In addition, I found that the more attractive semi-custom cards cost somewhat more than standard QSLs. Usually these cards are offered in additional colors and/or with a printed icon selected from a standard set.

With my busy schedule, I'm lucky to log one or two good QSOs per week—which multiplies to needing approximately a hundred cards per year. After reviewing the cost of professional QSL cards, I decided that it seemed like a good time to apply some ingenuity. I needed some way to produce quality QSL cards of my own.

I enjoy the unique QSL cards that I receive from my contacts around the world. I'm especially fond of the cards which depict a flavor of the area of the world from which they have come, or tell something special about the ham who sent it. There is some very beautiful scenery in my native state of Arizona, and I thought it to be particularly appropriate to have a desert scene as a background for the call letters on my QSL card. I envisioned my QSL card to look similar to a picture postcard with call letters on it. This vision seemed out of reach since I didn't know if I could afford standard cards—let alone the custom cards that I really wanted.

### Selecting the Right Camera

With this thought in mind, one day as I was dropping off some film to be developed, I noticed that the cost of 4″ x 6″ (jumbo) color snapshot reprints is only 23 cents each, regardless of the quantity ordered. Since standard-size QSL cards measure slightly less than jumbo prints, it occurred to me that I might be able to trim the edges of these large reprints and use them as full-color QSL cards. Having recently taken a few promotional snapshots of my mother's paintings, I decided to try a similar approach to the QSL card issue. I knew that if I could get a good QSL card negative I would be able to order reprints at 23 cents each, attach an information template to the back, and then trim them to the right size. I tried this idea and since it has worked so well for me, I thought that I'd share a few of the details with the rest of you.

To do an adequate photo job, a single lens reflex (SLR) 35mm camera is a necessity. If you don't have such a camera of your own, try to borrow one from a friend. SLR cameras have through-the-lens viewing so that the photographer can see exactly what the picture will look like before it is taken. (Without the through-the-lens viewing feature, parallax between the scene in the viewfinder and the actual picture taken may give poor results.) For my work, the standard 55mm general purpose lens worked well. With this lens, I was able to focus on surfaces as close as two feet away. You may find that the camera you use is a little different, but that will not make much difference and good results can be had with almost any 35mm SLR. The critical issue is that you can get close enough for the scene used as a background to fill the entire field of view.

### Designing Your Card

Initially, I chose one of my mother's paintings of the Arizona landscape as a background for my QSL card. For your card's background, you may choose any painting, map, photo or sketch that appeals to you; however, background pictures with dimensions smaller than about twelve inches may be too small and some of the border will show around the periphery. (Those of you with fancy lenses may not be limited by this constraint.)

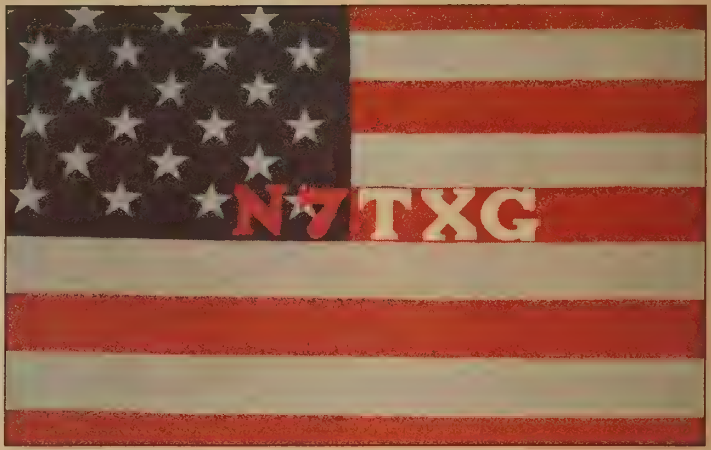


Photo D. Two-inch red and white characters over a cloth background. Distance: 60″. Lighting: indoors, flash.

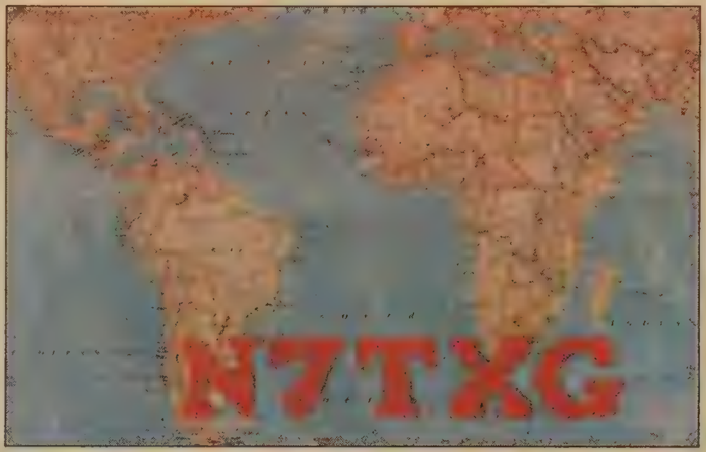


Photo C: Two-inch red characters over a printed world map. Distance: 48″. Lighting: Outdoors, open shade.

Carefully cut out neatly sketched paper letters of your callsign and place them over the background picture in an attractive arrangement. The block letters that I cut out were approximately two inches tall. This size seemed to be large enough to make them reasonably easy to cut out neatly, but not so large that they were difficult to fit on a relatively small background. I used scissors to cut out my callsign letters, but a hobby knife may work better for you. Take time to do a good job here. Neat letters will greatly enhance the quality of your final product. You may even find some commercially precut letters that you like, but then the cost goes up.

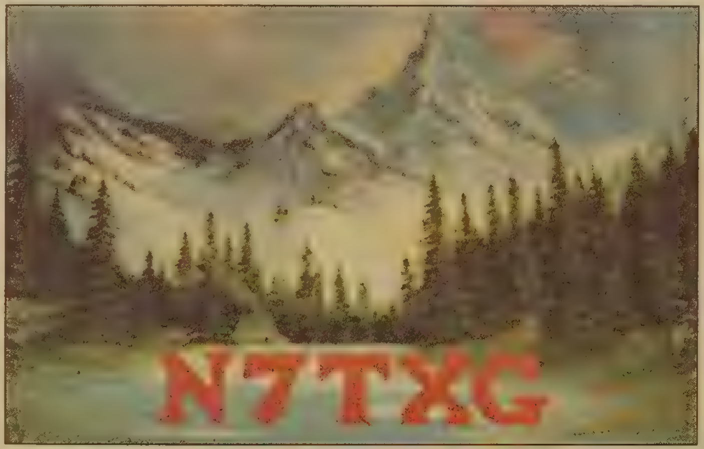


Photo B. Two-inch red characters over an oil painting of the Grand Tetons. Distance: 48″. Lighting: indoors, fluorescent.

Photo A. Two-inch red characters over a schematic diagram blueprint. Distance: 24″. Lighting: outdoors, open shade.

Since my mother's paintings are prized in our home, I didn't use tape to attach the letters to the background picture. I just placed the painting flat on the floor and then arranged the cut-out call letters around the painting until I was pleased with the way it looked. This is the place to get really creative in your work. You may set up your QSL card scene in any arrangement that you find appealing. Those of you who are artists may even wish to use one of your own paintings or sketches as a background.

Open shade seems to work the best for lighting since there is usually very little glare and it affords good color balance, but the job can be done inside using artificial light if you desire. Incandescent lighting creates a yellow effect which you may not like.

It is wise to take a few shots at slightly different distances to be sure that you get one negative that is exactly what you want. Remember again that you will have to trim the final photo a little to bring it down to the standard QSL size, so don't place your letters too close to the edges. You may even try taping your call letters to a large plate glass window and snap a picture of your front yard through the window. Those of you who like a picture of yourself at the key or microphone may think about taping your call letters to a sheet a glass and placing it between you and the camera when the shot is taken. Just be aware that if there is a considerable disparity between the distance to the call letters on a glass plate and the distance to the scene behind, they may not both be in focus at the same time. Remember, too, that a flash may reflect off a window or plate of glass.

### Finishing the Card

When your initial prints come back from the developer, look them over carefully and decide which one(s) you like best. Reprints in the 4″ x 6″ size will need to be reduced by approximately half an inch in both height and width to bring them down to the standard 3-1/2″ x 5-1/2″ QSL card size. Be sure to allow for this trimming as you select your final negative. When you order the reprint copies of your negative, you may want to consider matte finish if it's

**Continued on page 20**

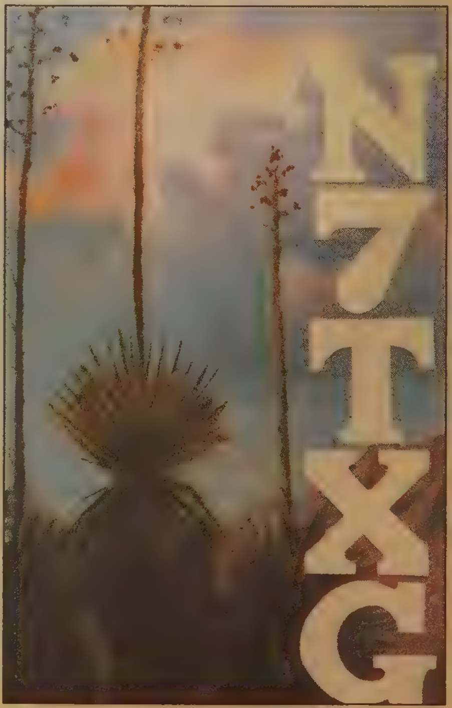
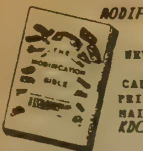


Photo E. Two-inch white characters over an oil painting of the Arizona landscape.



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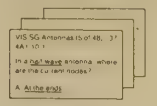

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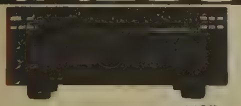

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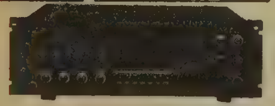

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| IC-2SA 2M mini HH | 41 .00 | Call $ |
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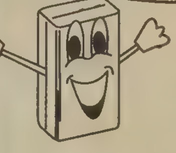

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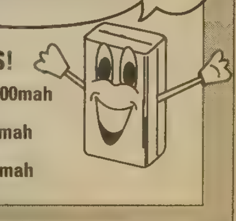

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CIRCLE 26 ON READER SERVICE CARD

## Custom QSLs

**Continued from page 18**

available since it shows fingerprints less than the glossy finish.

After your reprints are finished, all that remains is to type an information template on a sheet of paper that will be cut to size and attached to the back of each photo. The information template should provide a place for entering pertinent data about the QSO. As a minimum you will need: your callsign and location; a space for the callsign of the contacted station; the date and time of the QSO; and the frequency and mode of transmission. My template also includes a spot for an RST report, my mailing address, and a place for my signature. Leave space on the right of the template for the address and stamp. I used a photocopy machine to copy the templates three to a sheet. Rubber cement seems to be the best adhesive to use for attaching the information templates to the back of the photos. An old QSL card may be used as a guide when cutting your completed cards to size.

I have been very pleased with the full-color custom QSL cards I have developed by this process. Not only are they attractive, but they are easy to make and are relatively inexpensive, even in small quantities. By assembling my QSL cards in small batches of approximately twenty, I can do the job in just a few minutes, and the supply lasts me for several weeks. RF

*Contact Ken Gledhill N7TXG at 19503 Via de Arboles, Queen Creek AZ 85242.*

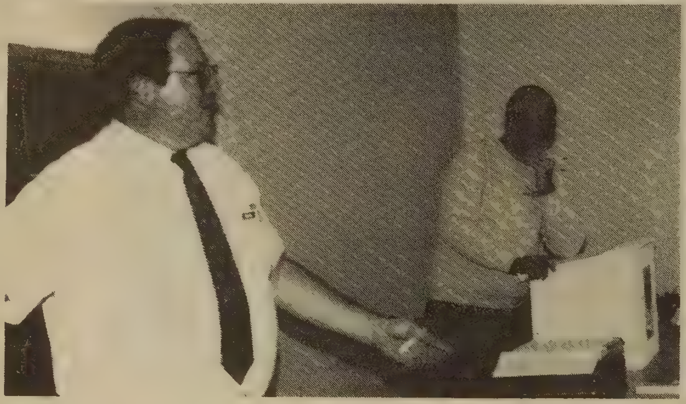
# updates

### The *Right* Way to Shrink Heat-Shrink Tubing

See the above-titled short piece on page 4 of the January 1992 issue. We forgot to give credit to the author—Michael A. Covington N4TMI, of Athens, Georgia. Our apologies. Thanks for a good tip, Michael.

### GHZ Engineering Tutorials

From Thomas B. Nast (callsign coming) of Seattle, Washington: ''I was disappointed to see no mention, in the ''Upgrade...Don't Stop Now'' column in the Dec. '91 issue, of GHZ Engineering (78-6997 Mamalahoa #K, Holualoa HI 96725-9701). Their question pools allow scanning the complete pool or taking sample tests, and the graphic illustrations appear with the questions (unlike the W5YI programs). Best of all, GHZ tests may be downloaded from the ''HAMNET'' forum of CompuServe, and are shareware—a $10 registration fee is requested. It would be a mistake to overlook these fine products.'' Thanks, Thomas. RF



**Speed Gray NS8V and Tom Mix WJ8R, members of the Grand Rapids Amateur Radio Association, W8DC, have been teaching Morse code and theory for about five years. They have over 85 graduates at the Kent Co. Red Cross Chapter. The latest Novice and Technician classes started last September. Students cover a wide spectrum of age and occupation. TNX Carl Thompson WA8AAT.**

**Photo A. This is August ES1AX at the Estonia Youth Hobby Center. The phone callsign is ES1WW; the cw callsign is ES1WN. The transceiver is a home-built UW3DI unit. The "small linear" above is an old army unit.**

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| BP85A 9.6v 600 mah 3" | $69.00 |
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# Tracking Down RFI Gremlins

## *Look for the simplest solution.*

by Floyd Soo KF8AT

The spring of 1991 held a new meaning for Lissa, my bride of eight months. It meant a reprieve from the long hours of shivering under a blanket, clad in sweaters, sweat pants and down booties. Normally, the living room and bedrooms would be toasty warm during winter because there is nothing amiss with the furnace, but every Sunday afternoon there is activity in the shack. At 20:00 UTC on 14.263 MHz, the Collins User Group meets. With my responsibilities as net control station, that means I am on the air for three to four hours those afternoons on my trusty KWM-2 or S-Line and the 30L-1 amplifiers.

Now, you might wonder just what my being on the air Sunday afternoons with the net has to do with Lissa sitting, trying to watch TV while shivering. Well, seems as though I had a gremlin lurking in the furnace and it enjoyed the hobby of ham radio as much as I did. When I transmitted, especially with the amplifier, this gremlin would get excited, and it would show its excitement by banging and rattling the gas control valve, or it would turn the blower on and off! There did seem to be a coincidence as to how its excitement would manifest itself, depending upon the band I was operating on. Twenty meters would bring on rattling and banging of the gas control valve, but 75 meters would normally elicit a response through the blower motor! Certain frequencies would even bring out a combination of both problems.

The roof-mounted Mosley tribander and dipoles were my immediate suspects. Their proximity was surely placing a strong RF field in and around the house. So, for months on end in my spare time in the evening and on weekends, I experimented with all the usual means of eradicating this unwanted gremlin. The normal problems plaguing the stereo system, the TV and the telephone were occasionally present, but it was the heating and air conditioning system that was the major nuisance. Tolerating a little RF rectification in the entertainment systems is one thing; having no heat or AC is quite another!

The usual array of filters were installed on the stereo, TV and telephone, with the usual degrees of success. In the meantime, I checked, modified and improved the RF grounds, scrutinized the grounding system of the furnace and the home electrical system, and inspected the feedlines and antennas. None of these gave any clues to a possible solution. The normal means of bypassing with capacitors did not do the job, neither did toroids or chokes installed on the associated wiring. I then took measurements on the plumbing system, the duct work and the I-beam in the basement, and they all were carrying some RF. Grounding these items in all different combinations did nothing to improve the problem. Even tying all the metal in the basement together to the shack's ground rod with grounding braid did nothing to help get rid of the RF.

In the meantime, summer arrived and the heat problem was no longer a concern, but when the air conditioning was energized, you guessed it! The gremlin was there, too! RF would kick the compressor of the air conditioning system on and off. So now Lissa would sit in the sweltering summer heat without air conditioning until I was done with the net. Most weekday evenings I was active on 75 meters, so it was not just on Sundays that I had the furnace and air conditioning shut down. In the summer *I* was okay because my shack is in the basement, where it remained cool, but upstairs it was plenty warm!

I continued to try different combinations of the usual solutions offered by many fellow hams, but alas, I was running out of ideas. Short of moving to a new QTH and relocating the antennas well away from the house, the only thing I had not tried was getting into the dry wall and running shielded cable to the thermostat and the compressor for the air conditioning. Most of the wiring to the thermostat was inaccessible because it was hidden in the walls, so out came my four-foot-long drill bit. After putting some strategically placed holes in the walls and floor, I ran some shielded cable in place of the original unshielded cable, and wudyouknow, it worked!

Last winter, someone had told me that when I finally found the proper fix I would probably kick myself for not trying it sooner, because it would more than likely be a simple solution! The logistics of this solution may not have been as simple as the solution itself, but as another friend told me, if I wanted to do something bad enough, I would find a way. That I did, exactly one year and one day after I installed the tribander!

Lissa is happier now, and that makes me happier too. I just cannot convey how fortunate I am to have such a loving, caring and patient wife. I know of many that would not have tolerated having a ham in the household, not to mention the gremlin in this story as well! Looks like that gremlin is no longer lurking in the furnace, but I have a feeling that it is just moving to another location. I can't wait to meet it again!

*Contact Floyd Soo at 18464 Ash Creek Dr., Mt. Clemens MI 48044.*

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CIRCLE 162 ON READER SERVICE CARD

# upgrade... don't stop now

by Gordon West WB6NOA

## Skip the Hard Ones

If you are preparing to study for an upcoming written examination, you need to know the ins and outs of the FCC question pool for the particular test you are going to take:

Element 2 — Novice
Element 3A — Technician
Element 3B — General
Element 4A — Advanced
Element 4B — Extra

Each examination element will have a total number of multiple-choice questions:

Element 2 — Novice: 30 questions
Element 3A — Technician: 25 questions
Element 3B — General: 25 questions
Element 4A — Advanced: 50 questions
Element 4B — Extra: 40 questions

You must score 75 percent or better to successfully pass an examination element:

Element 2 — Novice: Pass 22 out of 30
Element 3A — Technician: Pass 19 out of 25
Element 3B — General: Pass 19 out of 25
Element 4A — Advanced: Pass 37 out of 50
Element 4B — Extra: Pass 30 out of 40

If you don't pass a particular element, you may ask your VE team leader for a make-up examination. You will need to pay another $5.44 exam retest fee, except for the Novice class where the exam is free. The volunteer examiner team leader may elect to give you another exam (they can't give you the same test over again), or to deny you from taking a retest at this same session. This is why it's important to check with the VE well ahead of the exam date to see whether or not they permit retests. Some do, and some don't.

VEC Nancy Bucher N6XQR, a W5YI VE, comments, "We maintain meticulous paperwork on a form we call a 'traveler.' We record the candidate's test results on this traveler, take back the original exam along with the answer sheets, and then offer the candidate the next element up if he or she has passed, or a retest (and collect a fee) if they've failed. The traveler tells us what exam the candidate took so we never give them the same version of the same element at that session."

The VE team could also offer the next higher examination, even though you may have missed too many questions on the preceding test. That's right—if you failed the General written test, but were good as an engineer, you might ask to try the Advanced element, and receive a certificate of successful completion if you should pass that element. You would still need to go back and successfully pass the other elements leading up to Advanced in order to ultimately receive operating privileges.

I don't recommend skipping over an element and receiving credit. It gets too confusing for the examiners. Rather, if you should bomb an element, ask for a retest, or go home and study some more, and then finally successfully pass that test.

Each element of the examination is broken up into nine subelements:

Commission's Rules
Operating Procedures
Radio-Wave Propagation
Amateur Radio Practices
Electrical Principles
Circuit Components
Practical Circuits
Signals and Emissions
Antennas and Feedlines

There are a prescribed number of questions that will come out of each subelement. As an example, on the Novice test, exactly 10 questions will come from the subelement "Commission's Rules." On the Technician class examination, exactly five questions will be based on "Commission's Rules." On the General class test, exactly four questions will come out of "Commission's Rules."

"But what happens if the examiners give me the 25-question Technician examination, and most of the questions come out of the hard part, 'Electrical Principles'?" is a comment heard often at the examination sessions. IT WON'T HAPPEN! The Element 3A Technician class examination will only have two questions out of electrical principles. No more, no less! The volunteer examination team MUST adhere to the dedicated number of questions that must come out of each subelement.

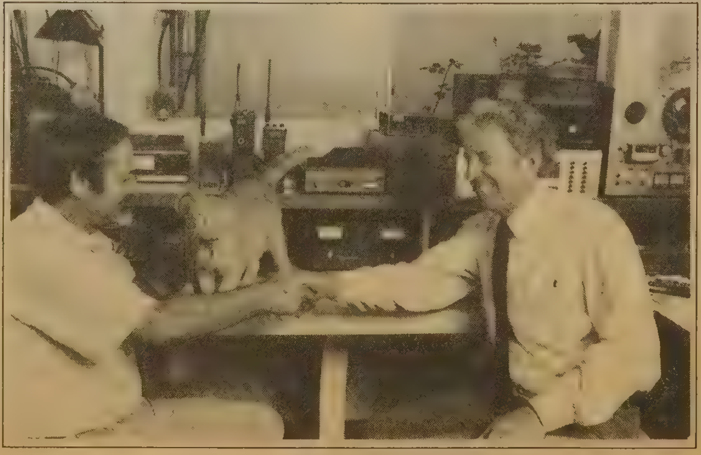
And the way the questions are electronically (by computer) picked from the question pool eliminates getting a succession of questions on a particular examination topic. Let's say you are rusty on how to work out Thevenin's theorem on your Advanced class exam. Yikes... that is in the Advanced class electrical principles section, and there are 10 questions from electrical principles. Any chance of getting all 10 questions based on the 10 individual questions on Thevenin's theorem? Almost unheard of. This is because computer-generated examinations are based on question topic numbers, and normally only one question out of each topic would be electronically picked for the test. But be assured that you are going to get at least one question out of a topic that has 10 questions—such as Thevenin's theorem—so don't bother holding your breath thinking that maybe they'll skip that particular subject completely. They probably won't!

What all this means is that you should study your question pool in its entirety, and save the tough questions for later review. If you're working on the computer with a W5YI or Diamond Systems question pool, it will electronically keep track of the questions you passed and the questions you missed. If you're working out of a study book, check off those questions you know cold, and then go back and restudy the harder questions.

If you find that you absolutely are befuddled with a particular topic within a subelement, save it for last. Don't let a single topic slow down your overall work on the question pool. Remember, if you just can't seem to find any help and have to completely pass over a specific topic, the maximum number of questions that will come out of that individual topic will probably be no greater than ONE.

Your local Radio Shack store has an ARRL-supplied data base of instructors and elmers who can help you master a specific stumbling block. Ask the store manager to boot up their computer on the ARRL elmer list. Find an ARRL-registered instructor near you, and give them a call and ask for some technical assistance. Many times they can help you out—right over the telephone—to help solve a specific question on any particular topic.

So good luck on your next written examination. Use as many different computer programs and study books as possible in order to prepare you for almost any type of test you are going to take. Remember, certain questions must come out of each subelement. And also remember that only one topic within each subelement MAXIMUM would normally be chosen for the test. RF



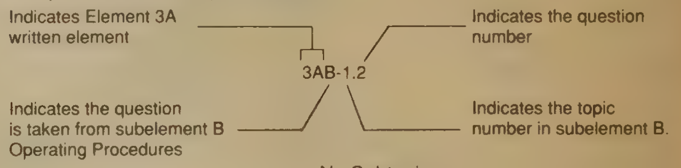
Another successful upgrade to Extra class!

### Question Coding

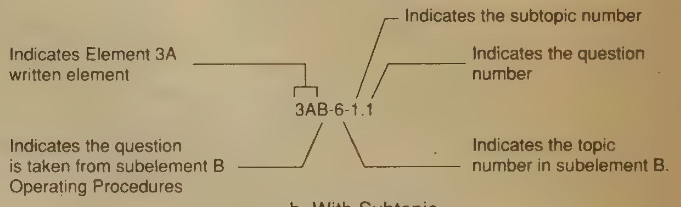
Each question of the 372 Element 2 question pool and the 326 Element 3A question pool is coded according to the numbers and letters assigned to each precise question. Figure 3-1 explains the question coding using the Element 3A as an example.

The coded numbers and letters reveal important facts about each question. Each subelement has a number of topics within it. Each topic is numbered, and the questions in each topic are numbered. Therefore, in Figure 3-1a, 3AB-1.2 indicates the question is an Element 3A question from subelement B (Operating Procedures). It is the second (.2) question for topic number 1 (RST reporting system).

If the question has a subtopic, as shown in Figure 3-1b, the subtopics are numbered and the questions in each subtopic are numbered. Question 3AB-6-1.1 is from the same subelement 3AB, but is the first question for subtopic number 1 in topic number 6.


Indicates Element 3A written element
Indicates the question number
3AB-1.2
Indicates the question is taken from subelement B Operating Procedures
Indicates the topic number in subelement B.

a. No Subtopic


Indicates the subtopic number
Indicates Element 3A written element
Indicates the question number
3AB-6-1.1
Indicates the question is taken from subelement B Operating Procedures
Indicates the topic number in subelement B.

b. With Subtopic

Figure 3-1. Examination Question Coding

*Courtesy of Gordon West WB6NOA and Master Publishing.*

### Retests

"The question of applicants constantly retaking examinations until they eventually pass is one that we (and other VE teams) have given considerable thought to. We must be very careful that we do not make a travesty out of the testing function. To repeatedly allow applicants to retake examinations—one after another—until they eventually pass is something that most amateurs are opposed to. The thinking is that anyone—qualified or not—can eventually pass a 25 or 30 question multiple-choice examination if they take it enough times.

"For this reason, we allow retests only when another test fee is paid. The feeling here is that the requirement of having to pay another test fee will have the effect of somewhat limiting excessive re-examinations. We are not certain that it is not all right to re-examine applicants who fail a test without paying another test fee. It is not the test fee that we are interested in. We feel that any applicant who fails a relatively short examination where the questions, multiple-choices and answers are all known is simply not ready to pass... and needs time for further review.

"We have a policy which allows sitting for unlimited new examinations if a person continues to pass, but requires a new test fee to retake a failed examination. Our rationale is that re-administration of a failed test is a new test session. (Please refer to our 1991 VE Manual, page 27, column 2, paragraph 2. Also, please review Example #6, Manifest of Applicants.)"

*Courtesy of Fred Maia W5YI, VEC.*

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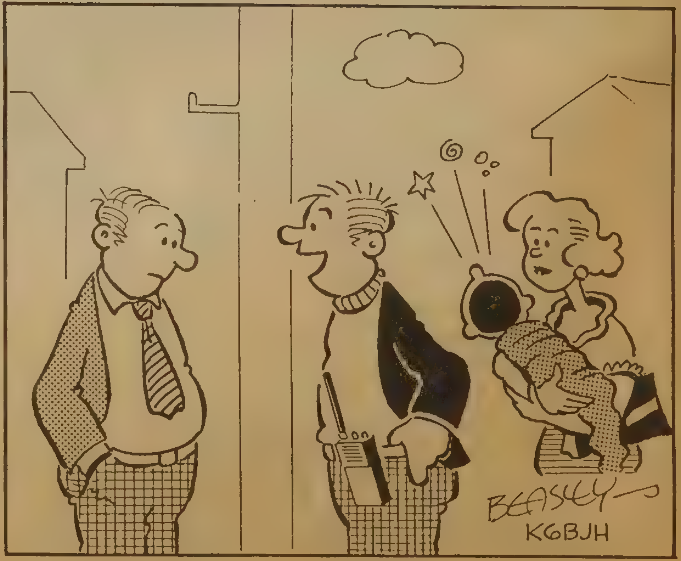

I NAMED THE LITTLE DARLING "Q.R. MARY!"

# the tech side

by Michael Jay Geier KB1UM

## More Batteries

Last month, we were discussing batteries. Let's continue.

NiCd battery packs can fail for reasons other than the memory effect. Like all things natural or manufactured, no two NiCd cells are exactly alike. If you take any two cells, charge them exactly the same amount and then discharge them at precisely the same rate, one will give out before the other. There's no way to know which will go first. The time difference may be only a few seconds for well-matched cells, or it could be a few minutes or more if the cells are mismatched.

So what? Well, imagine a series-connected battery pack. That is the configuration of all the packs used with HTs, camcorders and the other toys around your house. Just like the cells in a flashlight, each cell has its positive (+) terminal connected to the negative (−) terminal of the next cell. When you charge this pack, the current must flow through each cell to get to the next one. That works fine as long as the cells are fairly well matched. But remember, like I said, no two are exactly alike. So, some will be fully charged before others. The result is that a particular cell tends to get less charge, causing it to run out of power sooner. In the next charge cycle, it happens again, only worse, because the other cells still have some power, so they all owe less to get to the "weak" cell. Eventually, the imbalance gets so bad that the cell goes bad altogether. Also, because of the series arrangement, the other cells try to reverse-charge the first one to die, while you use the battery pack! After all, their plus and minus terminals are connected to each other in reverse, right? Reverse-charging a NiCd cell can ruin it by causing it to short circuit.

### Zap!

If you have a battery pack which seems to go dead shortly after you charge it, you may have one bad or weak cell. Charge it up and then run it down until the radio indicates "low battery." Now remove the pack and measure the voltage. If it is about 1.2 volts lower than its voltage rating, you probably have a shorted cell. Smaller voltage differentials suggest a weak one. Naturally, you can replace the pack if you're so inclined. Or, you can crack it open and try to save the bad cell. I've been successful at that many times. Once you have the pack open, measure the voltage across each cell. Most likely, you'll find all but one at 1.2 volts. The bad one will read 1 volt or less. To fix the pack, you must discharge each cell individually, and not through the other cells. I don't recommend simply shorting the cells out; they can dump *enormous* amounts of current and melt your wire, perhaps burning your hand. Instead, use a power resistor of a few ohms across each cell, one at a time. When the cell is well below 1 volt you can short it out. After you've done all the cells, including the bad one, short the entire pack out and let it sit overnight. The next day, take a power supply of about 1 amp current (your bench supply should do well, unless it is of the high current type) and set its voltage about 3 volts higher than the pack's rating. Connect the negative lead to the negative terminal of the battery pack, then touch the positive lead to the positive terminal for about three seconds. Now, measure the battery pack's voltage. If it is below its rating, zap it again until it comes up. Under no circumstances should you leave the power supply connected for more than a few seconds at a time. After the pack's voltage has returned to normal, charge the pack in the normal way. It should now work fine. If not, try running it through a few charge/discharge cycles, without any more zapping. If it still won't work, you have nothing to lose by zapping it again.

Batteries I've fixed this way seem to keep on working fine for long periods. Of course, sometimes the bad cell cannot be brought into balance with the other ones, so you will have to buy a new battery. Don't try replacing the bad cell with a new one; the new cell will be so far out of balance with the aged ones that quick pack failure is almost certain and you will have wasted your money.

By the way, be sure you use a current-limited power supply. Most of the IC-regulated supplies are so protected. If there is no current limiting, the fully-discharged battery pack, which looks darn near a short circuit to the supply, may cause so much current to flow that the supply gets damaged. My home-brew supply, with its LM-317 regulator, works fine.

### Using NiCds Other Ways

Most HT battery packs are sealed. If you open one up, you'll see that the cells are soldered in. In some, but by no means all, packs there are thermal or overcurrent sensors which prevent the packs' being overcharged. If there's a third terminal, that's a strong indication that there's a sensor. The reason I mention all this is that some people elect to avoid the high cost of premade packs. These folks buy the much cheaper alkaline battery case and then fill it with their own NiCd cells. Most radio manuals warn you not to do this, but the question remains: Does it work?

Well, sometimes. If the "real" packs have built-in sensors and you try to charge your homemade one with the original charger, chances are it will overcharge the cells into the sky and destroy them, because it is looking for a sensor signal that won't be there. If, on the other hand, the charger is a simple sensorless wall transformer, chances are it will work fine. Generally, 15-hour wall cube chargers are of the "dumb" type and work OK, while quick chargers are likely to have sensors and be unsuitable. But there's another problem.

### Irresistible

The cells in premade packs are al-

Continued on page 30

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## vintage RF review

# The Drake TR-4CW

by Dave Ingram K4TWJ

The R. L. Drake TR-4CW.

*Although the TR-4CW is no longer in production, look for this full-featured HF transceiver at hamfests and in the used market.*

Recently, I was confronted with the very pleasant task of selecting a new transceiver for my low-band setup at home. Such occasions are rather rare in my life, so I gathered information on every available unit and went over it with a fine-toothed comb. I wanted (among other things) a state-of-the-art rig with reliability, service, and station compatibility. As I have an extensive electronics background and could afford any one of the popular transceivers, my final choice was to be based on what I considered the best all-around rig.

While pondering this decision, I continued to enjoy my ever-faithful Drake TR-4 transceiver (five years service without any problems).

Then R. L. Drake Company announced their TR-4CW transceiver, and I knew that my decision had been made. If this transceiver performed half as well as my older TR-4, it would be a winner. If I ran into a problem that I couldn't solve in a few minutes time, I could phone the service department of Drake Company and get assistance. I could purchase any necessary parts from a local distributor. Now that's reliability! Another detail that I appreciated was being able to purchase extra Drake knobs and cabinets for my home-brew linear amplifier, SSTV monitor, and station control. This really added the ''professional matching touch'' to all my gear.

The R. L. Drake TR-4CW runs 300 watts SSB input and 260 watts CW input on the 80 through 10 meter amateur bands. A generous over-coverage on most bands permits tuning any band expansions that might evolve in the future. The dial is calibrated in 1 kHz increments, and visual interpolation to 250 Hz or 500 Hz is quite easy. Receiver sensitivity is better than 0.5 µV for a 10 dB signal-plus-noise ratio, which means that you can hear those weak stations without straining.

One of the outstanding features of the TR-4CW is its superb AGC action—less than 3 dB variation for 60 dB change in input signals. This means that an S2 signal and a 40 dB over S9 signal produce practically the same audio volume from the speaker. This feature is a super advantage if you like working DX, contests, or don't like a blaring rig when someone throws a 2 kW signal on frequency. The TR-4CW's 8-pole SSB filter has the same shaping factor and ultimate rejection as any 8-pole filter, but less in-circuit loss. It has an initial bandpass of 2.1 kHz and does a beautiful job of eliminating adjacent-channel interference. The big news on the TR-4CW is its 500 Hz CW filter. This filter is standard equipment—not an option—and it really pulls weak stations out of the mud. Either the SSB or CW filter can be front-panel-selected for CW use. If you like comfortable operating and a quiet but highly sensitive rig, the TR-4CW will spoil you!

Several front panel controls increase the rig's flexibility by serving a dual purpose. The transmitter gain control functions as an RF output level control on CW/tune, and as a mike gain control on SSB. The VOX sensitivity tracks with this control during SSB operation, but it can also be independently adjusted by a side-mounted control, if desired. In other words, should you decide to talk softer, you merely increase the transmitter gain and the VOX will follow it. The VOX can be overridden by merely keying the mike's push-to-talk. Another side-mounted control adjusts the CW sidetone level, which tracks with the receiver's front panel audio volume control. The RF tune control adjusts both the receiver's preselector and transmitter driver stages. If this is peaked during receive, the transmitter's driver is also tuned to resonance. The plate current meter reads relative RF output when the antenna load control is pushed in and final plate current when it's released. The receiver's S-meter functions as an ALC meter during transmissions. Selection of either 2.1 kHz or 500 Hz bandpass is accomplished by an extra position on the sideband switch. The TR-4CW will operate normally regardless of which filter is being used, so you can switch them as you like.

When my TR-4CW arrived at home, I had it unpacked and on the air within an hour. The rig was so quiet that I wondered if it was working properly. Then I connected an antenna, and signals blew me out of the room. You don't listen for background noise on a TR-4CW! The receiver proved to be as hot as a firecracker on all bands, and the transmitter registered 200 watts output on my W4 wattmeter (my ''second choice'' transceiver didn't run this much power input). I tuned the rig to 14.230 kHz and watched a few incoming SSTV pictures. Then I made a quick QSO with Don KH6HJF in Hawaii. After he assured me the barefoot rig was doing a good job, I tuned around 14.220 kHz and worked a couple of UK9s on SSB (and received 5 by 7 reports from both of them). I was feeling my oats by this time, so I flipped on my home-brew linear, wheeled down to 14.005 kHz, and called the weakest station I could find—a UL7. He came right back and gave me a 589. The W4 wattmeter indicated 850 watts output from my four 811As, which warrants explaining. Like many high-power linear amplifiers, my 811As are operated grounded grid. Although 75 or 100 watts of RF is sufficient to drive them, any additional driving power is simply added to the linear's RF output. The TR-4CW drives grounded grid amplifiers beautifully, and the power output is continuously variable with the transmitter gain control.

The next day, I made a couple of minor alterations to the TR-4CW. The dial lights were either too bright or too dim, compared to my SSTV monitor, so I replaced the pilot lamp limiting resistor, R116 (68 ohm, 1 watt), with a 47-ohm, 1-watt resistor. Then I adjusted the S-meter sensitivity pot, R187, so the S-meter didn't hit the peg when I keyed the mike. Next, I made an alignment tool from a filed coat hanger, stuck it through the cabinet top while the rig was operating, and adjusted C130 to tailor the audio response to my taste. This adjustment is somewhat critical and, if you get it misaligned, the background noise will change as you switch sidebands. ''Tweak'' carefully if you try this.

I've now operated the TR-4CW for several weeks, and I'm fully convinced that I made the right decision when buying it. I feel that I can use it for five or ten years and subsequent models will not destroy its resale value.

While brousing through hamfests, look out for theses matching TR-4CW accessories: a plug-in noise blanker (34PNB), fixed frequency adapter for net or SSTV group operations (FF1), AC power supply (AC4), speaker console (MS4), wattmeter (W4), linear amplifier (L4B) and a remote VFO (RV4C).

---

*This review is reprinted from the February 1978 issue of* 73 Amateur Radio.

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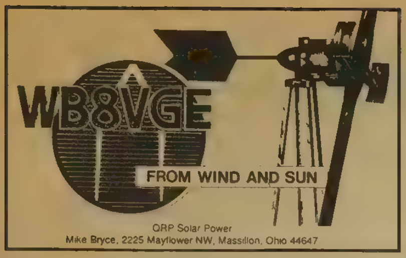
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# radio magic

by Michael Bryce WB8VGE

## Pinpointing the Problem

I enjoy fixing dead or broken radios. It really gives me a good feeling deep down inside that I can do this. I've saved a lot of money and in some cases made a buck or two by being able to get inside a radio. You can do it too, and without having to drop a huge bunch of money on test gear.

If you read over last month's column, you should have narrowed down the problem of the radio. Or at least narrowed it down to a good idea of what's wrong with the set. You don't have to place the blame on the exact part—not just yet.

### No Cheap VOMs

After you have the section of trouble pinpointed, we have to start digging out some test gear. For me, the best gear to use is a good digital VOM. I don't want you to run out and get a $200 VOM, but you should have something better than a $12.95 one. For your own safety, if for nothing else. Somehow, the cheaper ones don't seem to be as safe as they should be. They seem cheaper when you pick them up, too. I don't like that when I'm working on 900 VDC!

I also like to use an autoranging digital VOM. In case you've never used one before, I can tell you that they will save you a lot of time and, I believe, are a little bit safer to use. With an autoranging VOM, all you have to do is select DC or AC volts and the meter selects the proper range automatically. So, if you're not sure whether the point you're testing is 12 VDC or 300 VDC, the autoranging feature will tell you.

Some of the older autorangers were a bit slow, but the newer ones are really fast. This way, you can move the meter's probes from one point to another without changing the selector on the meter. You're able to keep an eye on the circuit and the meter's probes without putting them down to reset the meter. It's a whale of a lot safer, too.

And it's better for the meter. If you don't set the meter for the proper scale, and then you overload the poor thing—poof! Up in smoke she goes. This is especially true for the cheaper meters. The better digital VOMs have some type of built-in overload protection.

Someone will always tell you to take voltage checks when working on a radio. Voltage checks of what, you ask? Well, I did the same asking years ago and have yet to get a really solid answer. It's really hard when you don't have the schematic, or the proper schematic, in front of you. So what to do?

### First Things First

Go to the power supply and see if you can find the main voltage buss line. There may be more than one! This is really simpler said than done, because how many of us know what the main voltage buss line looks like? Well, I don't either, but you can get a fairly good idea by looking for one part of the power supply where lots of wires terminate to the same point, other than ground, of course. Look for large red or orange wires. These are almost always the positive (+) side of the power supply. This thinking won't work on circuits using a large PC board because Vcc (the supply voltage) runs are all over the place.

In a hybrid radio (using both tube and transistors) the power supply is normally tucked away in one corner of the chassis. Look there for a large wad of wires coming from all over the radio. Sometimes you're lucky, and they are marked as to what voltage is what.

From chassis ground, attach the negative lead of your VOM. Set the controls of the radio for normal receive operation. If you have an autoranging VOM, set the meter for DC volts. If you don't have an autoranging VOM, set the voltage selector for the highest value, usually 1000 VDC. Very carefully, touch the red probe to one of the terminals from the power supply. Write this value down. If you don't get a reading on this point, note that also. Measure all you see and note the voltages, if any. If you find the power supply output to be dead, you now can move backward toward the 110 volt AC supply.

Now, some people will start from the 110 AC supply and work forward, but for me and the experience I have, very few problems are on the 110 AC side.

If you don't have the schematic for the radio, and can't seem to find the main power buss line, try these areas next. The plates of the final RF tube(s) will have 600+ volts on them. Be very careful when checking around the tubes, as you can really get zapped. On a solid-state radio, check for + voltage on the collectors of the rig's final PA transistors. The input-to-voltage regulators are also a good place to check for voltage. As you can see, right now we're looking for any reading at all. It does not make any difference what the reading is, as long as you can see *something*.

If you can't find anything on the collectors or the plates, you'll have to dig deeper into the supply. But don't get carried away just yet. Sometimes one voltage is controlled by a secondary voltage.

Before you can start getting serious about voltage checks in the rest of the set, you have to know what is coming out of the power supply. In other words, why start looking for a supply voltage for the VFO if the power supply is not working? Why worry about having a low plate voltage on the driver if the plate voltage is low to begin with? Remember, some of the voltages listed on the schematics may be as much as 20 percent off from what they really are. Many times, the line voltage may be different, and give you a higher or lower reading. You have to know what the starting voltage is before you determine the other voltages are wrong. And that is where we'll pick it up next month. **RF**

---

*Michael Bryce WB8VGE, 2225 Mayflower NW, Massillon OH 44646.*

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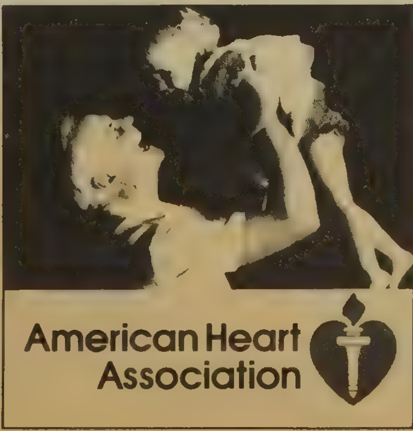

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CIRCLE 136 ON READER SERVICE CARD

# Getting Permission to Put Up Your Antenna

## *Break through the Bureaucracy.*

by SSG Michael R. Warner NX7T/DA1YH

It's not always easy to get on the air. Zoning regulations, ordinances, and restrictive covenants have been making it hard on hams in recent times. Well-intentioned people have made these codes, often without all the information they really needed. Otherwise they would not have restricted amateur radio operations!

Helping people make the correct decision about a question requires giving them sufficient information. When I was in sales, we had a saying that when a person said "No," they were really saying, "You have not given me sufficient reason to say 'Yes, tell me more....' " So we would. This made us appear a little pushy, but it frequently got a sale when we would have otherwise left empty-handed. If you have been turned down for erecting an amateur radio antenna, maybe you did not give the people in authority enough information to say "Yes."

Given enough information, almost anyone will respond with "Yes" to a *reasonable* request. Your letter of request should include all the information required to make a decision in your favor. You should not assume that the individual knows anything about amateur radio. If you don't provide enough information, he might assume that, at most, you are a CBer. You will have to educate the decision maker to see your request not only as reasonable, but as a positive contribution to the community.

This article was originally written for our club newsletter in Germany, Erlangen Amateur Radio Service (EARS), formerly the Iron Land Amateur Radio Association. There are references to Army regulations that will be of particular interest to those who live in government quarters. There are equivalent regulations with other military services, as well as state and Federal statutes or public statements of support in records of various legislatures. If you research them, you will find them helpful.

### How to Get a "Yes"

**STEP 1:** SELL AMATEUR RADIO! You may not have been directly involved in any actual emergencies since you have been licensed, or you may have worked many of them. It does not matter. In either case, you are a member of a group of people with a history of emergency preparedness for over 50 years. Your station has as much potential for future emergency situations as your antenna system allows, and *no more!* Use as much current information as you can find on the subject of recent disaster communications using amateur radio. Find references to locations as close to your home location as possible. The ARRL, your local library and newspaper, *QST, CQ, 73 Magazine,* newspapers, and even the *Congressional Record*; all will have usable information and arguments.

> *"Given enough information, almost anyone will respond with 'Yes' to a* reasonable *request."*

Quality information may be provided by ARES/RACES coordinators in your local area or state.

If they have been doing their job well, they also have developed contacts with some very powerful allies in the Emergency Management Agency (Civil Defense) and Red Cross officials in your area. They should possess letters of appreciation for activities during actual emergencies or emergency preparedness tests. Make a presentation to those in authority, and it will have a much stronger effect. And sell, sell, sell amateur radio!

What if Marconi had lived in a neighborhood with tower restrictions?

**STEP #2:** KNOW and be able to QUOTE the Regulations and Ordinances! They can be your friends. One of the hallmarks of amateur radio is our respect for the law. If you are in a community without existing ordinances, it may be in your best interest to seek an ordinance that spells out the right of licensed amateurs to have towers and antennas. Without such an ordinance, you may be at the whim of whoever is currently in charge, and that can bring problems down the road which may include court costs, judgments, or worse.

Research your state, county, city, or municipal government agencies to see what current regulations require of you. Other hams or your local club may be able to provide you with this information. If not, a direct assault on the courthouse is required.

While the FCC's PRB-1 is not the end-all that we all hoped it would be when it appeared, it is still a powerful statement of the recognized value of amateur radio. Properly presented, it will make a positive impact on policy makers.

Army Regulations (AR) 25-6 Para 1-5 is one of the strongest arguments you will ever read for setting up a respectable antenna system. Even if you are not in the Army, or do not live on post, this regulation can help you sell the value of your amateur radio system. It states simply that "The DA 'Department of the Army' policy is to.... Support, encourage, and cooperate in developing and promoting MARS and amateur radio activities to enhance their military and civil value...."

If you are in the military overseas, it is good at this point to add that amateur radio is a great aid to the Noncombatant Evacuation Operations (NEO), program. Your station will be available by regulations to assist with NEO.

With regulations as strong as these, you'd be inclined to believe nothing could stop you, right? Sorry, experience has shown many a ham that this is not enough!

**STEP #3:** Demonstrate your competence. Produce copies of your FCC license, and if applicable, your host nation amateur radio and MARS licenses. Point out that these licenses are issued only to technically qualified persons who have demonstrated their expertise to examiners certified under Federal Communications Commission Rules and Regulations. The manner in which you put your letter together is critical. The data, presented in logical order, must be in language that is specific and nontechnical. (It may seem like whitewash if it cannot be understood, or worse—it may be offensive!) Go to another ham or friend to work on this! Before submitting it, have a non-technical person read it and give you their honest evaluation. Make it sound professional, but not overbearing.

**STEP #4:** Take responsibility for everything! Anything that seems to create extra work for the office approving your request may be grounds for denial. Back to sales again, you need to "Sell the objection!" Any product has points that are potential negatives, real or perceived. To sell the objection, you must bring it up before the buyer (decision maker) thinks of it. Secondly, dismiss it logically before there is opportunity for the objection to take root! So what kind of objections might there be to your amateur radio installation?

- •Who is doing the work? If you are doing it yourself, state that you are, and give the names of any local ham club members who plan to help you. Give your qualifications and those of your helpers. If you are erecting a tower, be sure building codes permit you to do it yourself, and under what conditions, and show that you know the law by stating these steps in your letter. If you are contracting the work, say so. If you do not own the property, be sure to show that all costs for the installation will be paid from your own pocket, as will the costs to restore the property to original condition when you leave.

- •The next thing many people may think of is interference. If you fail to turn this objection into a concrete positive you may be fighting a losing battle! No office is equipped to be deluged by calls from irate neighbors. You must have a plan for such instances and the plan must involve them only as far as giving phone numbers for complainants to call, starting with your own! The next number should be the number of your local amateur radio clubs "Interference Committee" leader, then finally the FCC or host nation's agency if you are overseas.

In Europe, furnish a well-marked copy of USDA Reg 105-41 "Annex B," in particular highlight Para 3.f. and Para 4 a-c. Point out that the only authority properly equipped to determine fault is the host nation (Bundes-Post) and that you will comply with all restrictions and requirements they impose. Having done this you will have relieved the officials from these concerns. Should an incident occur you will be judged by people who are competent to do so rather than the buddy of the complainant. A final note, it is far better for you to call and ask for an inspection of your station by the FCC or host nations goverment agency than for your neighbor to do it. REMEMBER: In a bureaucracy the person making the complaint is presumed right! Such a presumption takes less work!

- •Another objection may well be $$$. Money! In these days of draw down, declining real estate values and financial insecurity, the last thing you want this person thinking is that you will cost the owners' money. To take care of this objection, you must have done well in conveying your own competence. You also need a specific plan with drawings indicating where wires, braces, poles, shingles, commercial or home-built antennas are to be placed, and why you need each one of them! You will not be penalized, in most cases, for giving too much information. Remember, it is your intention to give enough information to remove all doubts about your installation. So do it up right!

Make certain your plan complies with any ordinances, and state in your letter that it does. If possible, quote the regulation or ordinance. For instance, in Germany there is a requirement in roof installations that one third of the mast must be under the roof, for stability of the antenna support. A plan should reflect compliance with this requirement, and in the above case, indicate the bracing at the top and bottom.

- •If you are not already covered by liability and property insurance, at least offer to get it. If you have it, say so. Include the name of the carrier (ARRL insurance is not enough).

- •The next objection could be, "But why do you need all of those antennas? Won't just one do?" Handle this objection with a copy of the frequency chart from amateur regulations. Indicate which antennas cover which segments, and for what, in general, each set of frequency bands are used. To simplify and better illustrate this information, you might make a chart like the one shown.

- •Provide copies of the antenna specifications from the manufacturer. If you are making your antenna, include drawings from similar antennas in your favorite antenna handbook.

The objective of your letter should be to remove doubt regarding your installation, and create an appreciation for the value of amateur radio in general, and for your station in particular. Take the opportunity to educate the decision makers. Many short pamphlets are available from the ARRL and NARA. (Amateur Radio Relay League, 225 Main Street, Newington CT 06111. National Amateur Radio Association, 16541 Redmond Way, Suite 232, Redmond WA 98052.) The National Amateur Radio Association has one called "Ham Radio, King of Hobbies," by Don Stoner W6TNS. It is an excellent introduction to our hobby. Who knows, ham radio might be just what one or more of your decsion makers have been looking for! Be sure the information is applicable and not repetitive. Arrange the material in a manner that will be respected and appreciated, even if you have to pay a typist to do it. All these things will help you get the answer you want: "YES!"

### Antennas and Coverage

| Antenna Description | Frequency MHz | Range/Miles Short/Long | Directional/Nondirectional Point to Point Coverage |
|---|---|---|---|
| 8M Full-Wave Loop | 3.8 | 300/1,000 | No/Yes |
| Cushcraft R-7 Vertical | 7 to 29 | 1,000/Global | No/Yes |
| Cushcraft A-4 Beam | 14, 21 & 28 | 700/Global | Yes/No |
| Diamond X-500 Vertical | 146 & 440 | 50/NA | No/Yes |
| Dual Cross-Band Yagis | 144 & 430 | Sat/Space* | Yes/No |

*Amateur satellites provide worldwide communications. This system also permits authorized communications between shuttle missions and amateur radio operators on earth.

---

*SSG Michael R. Warner NX7T/DA1YH, HHC 2Bde 3ID, Unit #26907, APO AE 09066.*

# The Suction-Cup Dipole

## *Stick it in your window!*

by Dave Brandt WA3GPM

Need a simple antenna that will enable good 2 meter FM communications into and out of today's brick, concrete and steel buildings? Like most of my projects, this one is cheap and easy to make. It is a dipole antenna cut for 2 meters, approximately 37 inches long. Remember, the same formula that works for the HF bands also works for higher frequencies, but it requires two attachments, strings, etc., to hold it. I dispensed with the strings and such by using those soft plastic suction cups that hold toy animals to the inside of car windows.

Today, most modern buildings have an ample number of windows, many of which cannot be opened. By simply attaching a small suction cup to the end of each leg of the dipole, as well as to the center coax feedline connection, you can stick the antenna to the inside of any window in any position or polarization. And if the window happens to be on the top floor, so much the better! Just think of the wide coverage you can get from such a location on a very low amount of power. By using a short run of coax you can set up an effective communications center at a comfortable distance from the window, or at any available table.

Sure, the dipole doesn't give any gain, but you should also remember that the rubber ducky itself is only 7% efficient. Besides, if you want to hold that Statue of Liberty pose in order to conduct emergency communications, that is your business! It is incredible how fast your blood can rush away from your fingers when your hand is elevated in just such a manner.

Vertical antennas all need an effective ground plane in order to perform well, but the dipole inherently has its own, by design. This whole antenna and feedline can easily be coiled and stored inside a small plastic Ziploc® bag, making it easy to carry around with you until you need it.

After reading this, you might excitedly exclaim, "A simple solution to a simple problem from a real simple-minded guy!" I won't mind a bit. Try it and remember to accept all those great signal reports you are going to receive with dignity and a serious sense of humor. That basic antenna design comes into use for more than just HF applications. In our world of concrete, steel and glass, this suction-cup dipole really holds its own! RF

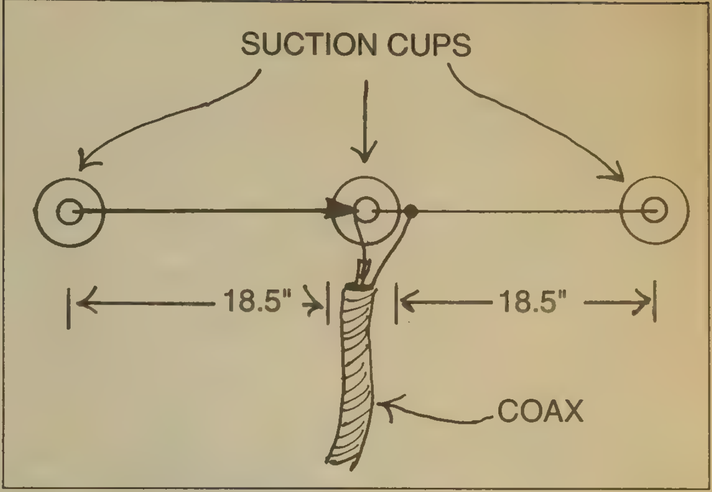
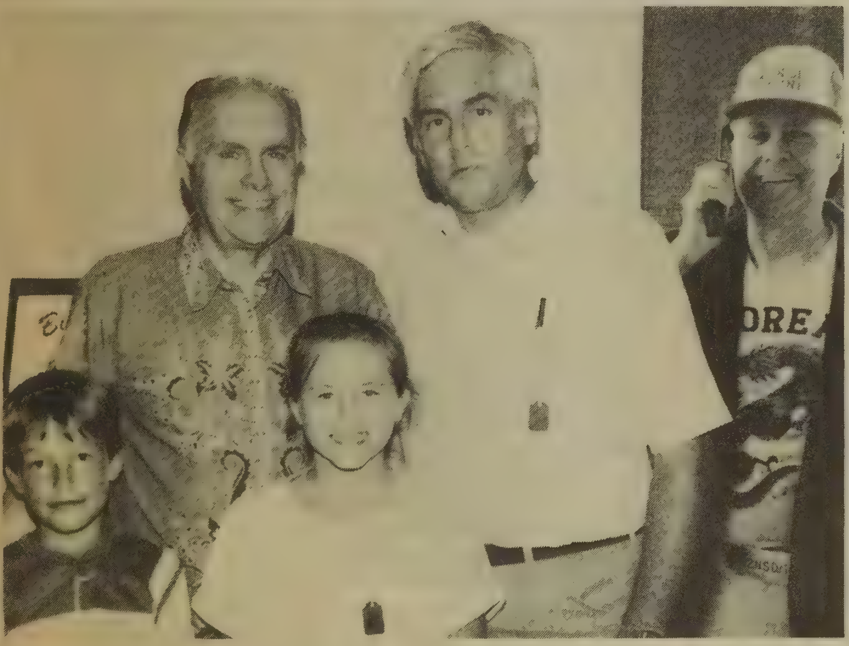


Figure. The Suction Cup Dipole.

*Contact Dave Brandt WA3GPM at 636 East Lehman St., Lebanon PA 17042.*



**A dream-come-true: A member of Wayne's Florida Fan Club, Mike Adams N4EVS (middle, rear), meets "NSD" (left rear; the Wayne on the right is a life-size photo) at the Atlanta Hamfestival last July after 27 years of following his work in *CQ* and *73*. Pictured are (front, left to right) Jason Stanton (currently studying for his Novice) and Lorene Adams KB4KZU (the youngest licensed ham at the fest). Wayne Green, publisher of *Radio Fun*, has also published *73 Amateur Radio Today* for the past 31 years.**

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CIRCLE 119 ON READER SERVICE CARD

# Radio Fun flea market

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The *Radio Fun Flea Market* costs you peanuts (almost)—comes to 10 cents a word for individual (noncommercial) ads, and 70 cents a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple of months before the action starts; then be prepared. If you get too many calls, you priced it too low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right, and maybe you can help make a ham newcomer or retired old-timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested.

Send your ads and payment to *Radio Fun Flea Market*, Sue Colbert, Forest Road, Hancock NH 03449 and *get set for the phone calls.*

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**INEXPENSIVE HAM EQUIPMENT** Send stamp for list. WA4DSO, 3037 Audrey Drive, Gastonia NC 28054. RF559

**LAMBDA AMATEUR RADIO CLUB** International amateur radio club for gay and lesbian hams. On-air skeds, monthly newsletter, and annual gathering at Dayton. (215) 978-LARC. P.O. Box 24810, Philadelphia PA 19130. RF812

**SUITCASE BEAM**— 10m or 6m, $40. Order 1–800–926–7373. Technote, $7. Info., $1. AntennasWest, Box 50062F, Provo UT 84605. RF888

**FREE** Ham Gospel Tracts, SASE, N3FTT, 5133 Gramercy, Clifton Hts. PA 19018. RF960

**CONNECTICUT'S FAVORITE HAM STORE** Rogus Electronics, 250 Meridenwtby Turnpike, Southington 06489. (203) 621–2252. RF994

**Join FAIRS—The Foundation for Amateur International Radio Service.** FAIRS is hams dedicated to building international friendship by providing technical assistance, training, exchange visits, and equipment donations on a global basis. Free information. P.O. Box 341, Floyd VA 24091. (703) 763–3311/382–9099. RF995

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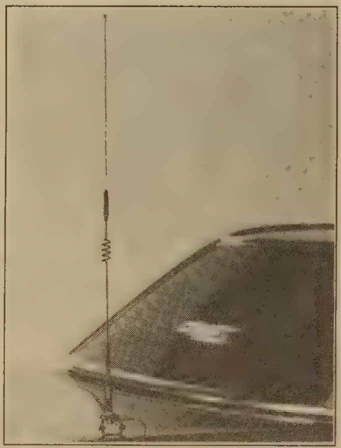


## NCG

COMET Antenna has recently introduced two new antennas for dual-band operation on the 2m/70cm amateur bands. Model B-10 (left) is 12″ tall and radiates 1/4 wave on 2m and 1/2 wave on 70cm; B-20 (right) is 30″ tall and radiates 1/2 wave on 2m and 5/8 wave on 70cm. Both are anodized black for excellent appearance and both are available with either PL-259 or NMO style connectors. The antenna is shown mounted on the COMET RS-9 Trunk Lip Mount, using the CK-5M Coax Cable Assembly, with RG-188A/U coax extending 12″ from the mount. This thin coax enables the trunk lid to shut without damaging the coax or starting a water leak into the trunk. COMET has many external mounts that do not require a hole drilled in the vehicle.

For prices and more information, contact your local amateur radio dealer or *NCG, 1275 North Grove St., Anaheim CA 92806; (714) 630-4541, (800) 962-2611, Fax: (714) 630-7024.*

## HART PUBLISHING

Hart Publishing has released the second volume of the 1992 *Amateur Radio Mail Order Catalog and Resource Directory*, a fingertip, one-source look-up book indispensable for both newcomers and veteran operators. The catalog has 150 pages and more than 1,000 entries of mail-order products and services for hams, categorized and alphabetized into easy-to-find headings from "Antennas and Towers" to "Weather Instruments." Each listing has the name, address, phone and fax number of the vendor, plus a description of the product or service. The *Resource Directory* part contains a useful collection of directories ("Directory of Free Catalogs," "Directory of Radio Clubs," "Directory of VECs," etc.).

The catalog costs $6, plus $2.25 First Class postage; a 2-issue (January and July) subscription is $15 First Class postage paid for the U.S., $19 foreign. For more information, contact *Hart Publishing, 767 South Xenon Court #117, Lakewood CO 80228; (303) 987-9442.*

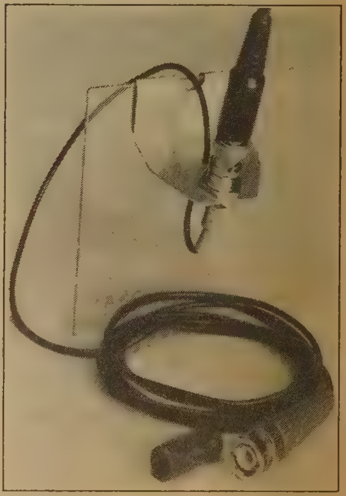
## UNIVERSAL ELECTRONICS

*The Easy Wire Antenna Handbook* by Dave Ingram K4TWJ is a new practical and easy-to-understand book giving you all the necessary dimensions for a full range of "sky wires" (no complicated formulas!), plus many of Dave's antenna secrets and "how to" helps. These antennas are low cost, easy to erect and use. The book is a reference you can use any time you complete a new sky wire. It includes useful drawings and tables. It is a must for both the new amateur and the old-timer.

*The Easy Wire Antenna Handbook* is published and distributed by *Universal Electronics, Inc., 4555 Groves Road, Suite 13, Columbus OH 43232; (614) 866-4605, Fax: (614) 866-1201, orders only: (800) 241-8171.*

## OAK BAY TECHNOLOGIES

Oak Bay Technologies' Rubber Duck Window Mount (Model AM-101B) is a convenient, easy-to-use antenna that frees radio frequency from the shielding confines within a car. This rust-resistant, stainless steel antenna mount dramatically improves mobile handheld performance, and is ideal for emergencies. Its portable, lightweight design makes it the perfect traveling companion for rental cars. It is specified at 50 ohms, handles 15 watts of power, works with either single-band or dual-band antennas, and fits most vehicle windows.



The Model AM-101B includes 6 feet of RG-174U coax, custom strain relief, and a custom BNC protector. It is available from amateur radio dealers for a suggested list price of $24.95. Contact *Oak Bay Technologies, %Evelyn Garrison & Associates, Issaquah WA 98077; (206) 557-9611, Fax: (206) 557-9612.*

## THE FORBES GROUP

The Forbes Group is offering the 2m Ventenna™, which you can install in less than 10 minutes. You slip it over an existing vent pipe on the roof. Circumventing restrictive ordinances and covenants, it becomes part of the vent. Once installed, the Ventenna is virtually invisible. It covers the entire 2m band, and handles full legal power.

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20N092 **The Wonderful World of Ham Radio** ***by Richard Skolnik, KB4LCS*** This book addresses the plea that something simple, clear, and fun be written to introduce young people to amateur radio. Pick up one for the new ham in your life. **$7.95**

20N099 **Digital Electronics Projects for Beginners** ***by Owen Bishop*** contains 12 digital electronics projects suitable for the beginner to build with the minimum of equipment. 128 pp., 56 line drawings **$12.50**

20N100 **Electronics Build and Learn (2nd edition)** ***by RA Penfold*** combines theory and practice so that you can `learn by doing.' Full construction details of a circuit demonstrator unit that is used in subsequent chapters to introduce common electronic components. Describes how these components are built up into useful circuits, oscillators, multivibrators, bistables, and logic circuits. 128 pp., 18 photos, 72 line drawings. **$12.50**

AR2073 **Novice Antenna Notebook** A beginner's guide to easy and effective antennas and tuners you can build. **$8.00** An ARRL Publication.

AR2871 **W1FB's Help for New Hams** ***by Doug DeMaw W1FB*** Complete for the newcomer. Put together a station and get on the air. **$10.00** An ARRL Publication.

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03K205 **Guide to Radioteletype (RTTY) Stations** ***by J. Klingenfuss*** Updated book covers all RTTY stations from 3MHz-30MHz. Press, Military, Commercial, Meteo, PTTs, embassies, and more. 105 pp. **$12.95**

11RF13 **The "Top Secret" Registry of US Government Radio Frequencies (7th Ed.)** ***by Tom Kneitel K2AES*** This scanner directory has become the standard reference source for frequency and other important information relating to the communications of federal agencies. 25 to 470 MHz. **$19.95**

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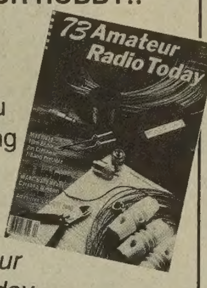

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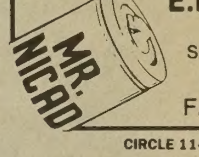

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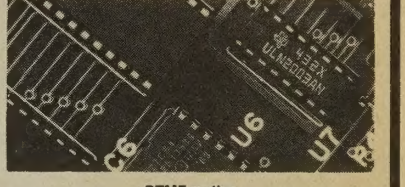

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RF0292

## the tech side

Continued from page 23

ways soldered into place; they never use spring contacts. There's more to that than simple manufacturing economy. NiCds, which are about 0.25 volts per cell lower than primary (non-rechargeable) cells, have very little margin for contact loss. You need all the voltage they can deliver. Unfortunately, contact resistance is a very real phenomenon. In my experience, it seriously affects the operation time of NiCd cells, and it affects the charge balance from cell to cell, too. Overall, unsoldered NiCd packs just don't seem to work nearly as well as the soldered variety. If you want to make your own soldered pack, be sure to get cells with solder tabs on them; soldering to regular cells tends to cause so much heat damage that the cells get ruined.

### Other Battery Types

Although the NiCd pack is pretty much standard for HTs, other kinds of batteries get used in some ham setups. The second most common type is the alkaline AA cell. These cells are not rechargeable. Really. If you try, you will probably split the cell open and make a caustic mess. Unlike NiCds, though, they work fairly well with spring contacts. Most walkies sold today offer the option of an empty AA cell holder. I strongly recommend it, because you can put a fresh set of batteries in and always know you have power, without waiting for a charger. It's a particularly effective setup if you don't use your walkie constantly.

> **"Unfortunately, contact resistance is a very real phenomenon."**

I don't use mine enough to keep two NiCd packs alive. One would surely go bad while I waited for the other to be used up. So, I got just one NiCd and one empty AA cell holder. Ninety percent of the time I use the NiCd, saving the cost of the AA cells.

On the rare occasion that I need to use the radio while the NiCd pack is being charged, I know I can. Also, when I travel, I don't have to bring the charger and keep track of when I last charged the pack. I just put in a fresh set of alkalines and go. So what if I go through two sets on a trip?

### Different Characteristics

Alkalines behave very differently from NiCds. First of all, they have more power than the rechargeables. Typically, an alkaline pack will last from one-and-a-half to two times as long, or more, as a NiCd pack of the same physical size. But the power output of your walkie will gradually go down as the cells are used up, rather than staying constant until the very end like it does with NiCds. Also, the battery monitor (if you have one) on your radio will indicate "low batteries" sooner. Unlike with NiCds, though, you can continue operating until the walkie quits, because cell damage is not an issue.

These differences in operating characteristics are caused by the fact that alkalines do not have the flat discharge curve of NiCds. That is, the alkalines' voltage drops continuously as you use them, while the NiCds stay pretty constant until they are nearly dead. Oh yes, contact resistance can still be a problem with alkalines, especially when they are weak. If your radio seems to cut in and out, or the batteries die on transmit even though they are fairly new, open up the case and gently bend the contacts out a bit; the connection may be poor. Also, periodically clean them to avoid the oxidation that cruds up so many battery packs.

### Heavy, Man

Another battery technology, less frequently seen in the ham world but still viable, is the lead-acid gell cell. These batteries use chemistry very similar to the big monster that starts your car, but with an important difference: The acid electrolyte is in a jelly form and the batteries do not need to be vented or operated in a particular position.

Gell cells are much heavier than NiCds, and they do not contain as much energy in the same space. They are, however, much longer lived if they are not abused. Unlike NiCds, they have no memory effect and do not tend to exhibit charge imbalance problems between cells. With gell cells, you charge them up after you use them, whether you've run them all the way down or not. In fact, it is better to avoid deep discharges. Properly used gell cells can easily last five or even 10 years, while NiCds rarely go beyond three.

Unfortunately, they don't make gell cells in the very small configurations we usually use. I wish you could buy them in AA size, but you can't. However, you can get them in sizes appropriate for belt-worn packs, and floor-standing units suitable for running HF rigs.

Well, that's about all the room I have this month. We'll continue this next time. Till then, 73 from KB1UM. RF

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